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THE
INTERNATIONAL CYCLOPÆDIA.

THE INTERNATIONAL CYCLOPÆDIA

A COMPENDIUM OF HUMAN KNOWLEDGE

REVISED WITH LARGE ADDITIONS

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THE INTERNATIONAL CYCLOPÆDIA.

STRANGFORD, PERCY CLINTON SYDNEY SMYTHE, 1780-1855; Irish scholar and diplomat; during the period 1817-25, successively British ambassador to Stockholm, Constantinople, and St. Petersburg; in 1825 created Lord Penshurst; author of a translation of the poems of Camoens. His son Percy, 1825-69, was an Orientalist.

STRANGULATION may be defined to be "an act of violence in which constriction is applied directly to the neck, either around it or in the fore part, so as to prevent the passage of air, and thereby suddenly suspending respiration and life."—Taylor's *Principles and Practice of Medical Jurisprudence*, 1865, p. 673. This definition, as Dr. Taylor observes, obviously includes hanging (q.v.). *Hanging* has been already briefly noticed in a special article, but the medico-legal relations of this and the other varieties of strangulation have still to be considered.

When the suspension of a body has not continued for much more than five minutes, and the parts about the neck have not suffered violence, there is a probability that resuscitation may be established; although many cases are recorded when, after only a few minutes' suspension, it has been found impossible to restore life. It is believed that death takes place very rapidly, and without causing any suffering; the violent convulsions that are so often observed being similar to those which occur in epilepsy. A man named Hornshaw, who was on three occasions resuscitated from hanging—a feat which he performed in London for the amusement of the public—stated that he lost his senses almost at once, and other persons who have been restored state that the only symptoms of which they were conscious were a ringing in the ears, a flash of light before the eyes, then darkness and oblivion. The treatment to be adopted after the patient has been cut down may be briefly summed up as follows: exposure to a free current of air, cold affusion if the skin is warm, the application of ammonia to the nostrils, of mustard poultices to the chest and legs, and of hot water to the feet, and the subsequent abstraction of blood, if there should be much cerebral congestion; artificial respiration should also be tried if the above means fail to re-establish the respiratory process. From the post-mortem appearances, together with circumstantial evidence, the medical practitioner is not unfrequently called upon to decide such questions as these: Was death caused by hanging, or was the body suspended after death? Was the hanging the result of accident, homicide, or suicide? For the full discussion of these questions the reader is referred to chap. 53 of Dr. Taylor's volume. In case of strangulation from other causes than that of hanging, the post-mortem symptoms are similar, but the injury done to the parts about the neck is commonly greater. In manual strangulation, the external marks of injury will be in front of the neck, about and below the larynx; and if death has been caused by a ligature, the mark round the neck will be circular, whereas in hanging it is usually oblique. The internal appearances are much the same as in the case of hanging.

STRANGURY (Gr. *strangæ*, that which oozes out, *oureo*, I micturate) is perhaps to be regarded as a symptom rather than a disease. It shows itself in a frequent and irresistible desire to pass water, which is discharged, however, in very small quantity, and whose passage from the bladder is accompanied with scalding and cutting pains along the course of the urethra. The pain often extends to the bladder and even to the kidneys, and is sometimes so severe as to implicate the lower bowel (the rectum), and to produce the straining condition known as *tenesmus*. It is usually caused by irritating substances in the urine, especially by *cantharides* or Spanish flies (whose irritant principle is liable to find its way into the renal secretion, whether the above named drug is taken internally or merely applied to the skin as a blistering agent), and by oil of turpentine, when administered internally in small doses, and is generally present in cases of gravel. Severe as the affection is, it is very transitory, and yields readily to treatment.

After the removal of the cause, if it can be recognized and the removal is possible, a dram of laudanum in a wineglassful of starch mucilage should be thrown into the lower bowel, and mild mucilaginous draughts (of barley-water, for example) should be freely given in order to render the urine less irritating. The warm bath is also useful, and if it cannot readily be obtained, hot local fomentations often tend to relieve the pain and allow the urine to pass more freely.

STRANRAER, a royal and parliamentary burgh, seaport, and market town of Wigtonshire, at the head of loch Ryan, 6 m. n.e. of Portpatrick. There are no manufactures, the town depending almost wholly on the agricultural interest. A mail steamer runs daily between Stranraer and Larne, in Ireland. Stranraer unites with the Wigtown burghs in sending a member to parliament. Pop. of parliamentary burgh, '91, 6193.

STRAP, in carpentry, an iron band fixed round two or more timbers, sometimes with branches along each, to hold them all firmly together.

STRASBOURG (Ger. *Strassburg*), a fortified t., formerly the capital of the French department of the Bas-Rhin, but, since 1871, capital of the new German province of Alsace-Lorraine, stands at the confluence of the Ill and the Brutsche, and not far from the left bank of the Rhine, 89 m. n. of Basel, and 312 m. e. of Paris by rail. The citadel, originally built by Vauban, 1684, was demolished by the Germans during the bombardment of 1870, but in 1873 they began to rebuild it, and this, in conjunction with a system of 14 detached forts, being erected at several miles' distance from the walls, will make the position one of great strength. The most celebrated building is the minster, or cathedral, founded in 1015, which is one of the most sublime specimens of Gothic architecture. Of the two western towers, one, that at the s. corner, has not been completed. The other, finished in 1439, rises to a height of 465 ft. above the pavement, making it one of the highest buildings in Europe (Cologne cathedral, 512 feet; Rouen cathedral, 484 ft.). The minster has a remarkable astronomical clock representing the planetary system. Other notable structures are the Protestant church of St. Thomas, with the tomb of Marshal Saxe, and various monuments to distinguished Strasbourgh scholars; the *Temple Neuf*, or new temple, rebuilt since 1870, the synagogue of the Jews, the town-house, the palace of justice, the arsenal, the episcopal palace, and the theater. The University of Strasbourg was the only complete university in France—i. e., the only one which has the full complement of faculties—besides that of Paris. It was founded in 1621, became specially famous in the branches of medicine and philology, went to the ground during the great revolution, and had its place supplied by an *école centrale*. In 1803 a Protestant academy was established, with 10 chairs, for teaching theology, philology, philosophy, and history. Five years later, Napoleon founded an imperial academy, with faculties of law, medicine, physical science, and philosophy; and in 1819 a partial fusion of these academies took place, greatly to the benefit of both. The university was reopened after the Franco-Prussian war, in May, 1872. In 1896 it had during the summer semester 971 students. The famous library of Strasbourg, consisting of nearly 200,000 volumes, and rich in *incunabula* (q. v.), was entirely destroyed by fire during the bombardment in 1870, but has been more than replaced by a library contributed by the Germans. The trade of Strasbourg, especially its transit trade, is very extensive and steadily increasing and it has a great variety of manufactures—machinery, cutlery, musical instruments (pianos and organs), watches and clocks, carpets, oil-cloth, paper, leather, cottons, woollens, silks, jewelry, artificial flowers, perfumeries, bonbons, chocolate, preserves, brandy, potash, tobacco, etc. The beer of Strasbourg and the *pâtés-de-foie-gras* (*gänseleberpasteten*) are famous. The Basel and Baden railways, the railway to Paris, and the communication with Rotterdam and London by means of the Rhine steamers, as well as with the Danube and all the great rivers of France by means of canals, have greatly added to its facilities for conducting commerce. The country round about Strasbourg is fertile and carefully cultivated, with beautiful gardens, mansions, and villages. Pop. '95 (including a garrison of 15,493 men), 135,608, of whom about one-half are Catholics.

Strasbourg, the *Argentoratum* of the Romans, was extant before the time of Cæsar, but is first mentioned by Ptolemy. The Romans had a manufactory of arms here. In the 5th c. it appears to have received the name of *Strata-Burgum* or *Strata-Burgus*, perhaps from the invading Franks, whence the modern German Strassburg and the French Strasbourg. It became a free town of the German empire, and in 1681 passed with the rest of Alsace into the hands of the French, under whom its population and prosperity greatly increased. On Sept. 28, 1870, after a bombardment of seven weeks, Strasbourg surrendered to the Germans, and in 1871 was annexed to Germany.

STRATEGY is defined by military writers to be the science of maneuvering an army out of fire of the enemy, as *tactics* is the art of managing it in a battle, or under fire. Strategy is the greater science, as including all those vast combinations which lead to the subsequent available displays of tactics. A good strategist has to attend to the establishing of his bases and depots, although some brilliant generals have dared to act without these last aids—notably, Sherman in America in 1864, and Wellington in 1813, advancing from Portugal through Spain into France. The strategist must know how to diffuse the influence of his arms over a broad area, while yet holding his force well in hand to strike crushing blows. Such was Wellington's Salamanca campaign; in which,

though retreating himself to his former base, he compelled the French to evacuate Valentia.

Strategy must not be confounded with stratagem, although there is relationship between the two. Stratagem is any device for deceiving the enemy as to the point or strength of an attack. Such are ambuscades, feints, bugle-calls to imaginary troops, concealment of infantry by clouds of cavalry, and many other efforts.

STRATFORD, a suburb of London in the borough of West Ham, about 4 miles east of St. Paul's. It is the seat of various and extensive manufactures. There are flour-mills, distilleries, and chemical works. In the town and its suburbs, many London merchants have built residences. The prosperity of the town has been much increased by its connection with the Eastern Counties railway. Pop. '51, 10,586; '61, 15,994; '91, 42,982.

STRATFORD, city, port of entry, and co. seat of Perth co., Ontario, Canada; on the Avon river, and the Grand Trunk and the Georgian Bay and Lake Erie railroads; 88 miles w. of Toronto. It has good waterpower; flour, salt, and planing mills; manufactories of iron castings, mill machinery, steam engines, woolen goods, leather, boots and shoes, and farming implements; Grand Trunk railroad shops; several churches; private and branch banks; one of the handsomest railroad stations (the Grand Trunk) in the province; and attractive co. buildings. The imports and exports of merchandise average about \$600,000 each per annum. Pop. '91, 9,501.

STRATFORD-DE-REDCLIFFE, **STRATFORD CANNING**, Viscount, English diplomatist, was son of a London merchant, and cousin of the celebrated George Canning. He was born 1786, educated at Eton, and entered himself at King's college, Cambridge, in 1805, but left in 1807, on receiving an appointment as *précis* writer in the foreign office. He was appointed secretary of embassy at Constantinople in 1808; and on removal of his chief, Mr. Adair, to Vienna, 1810, remained as minister plenipotentiary, and as such effected the important *Treaty of Bucharest* between Russia and Turkey. He was sent as envoy to Switzerland in 1814. About this time he published an ode full of spirit and power, entitled *Buonaparte*. It is called by lord Byron a "noble poem." In 1820 he went as plenipotentiary to the United States, and remained at Washington three years. In 1824 he was sent on special missions to St. Petersburg and Vienna. In 1825 he was appointed by Mr. Canning, then foreign secretary, as ambassador extraordinary to the sublime porte. Here his good offices were warmly exerted on behalf of the Greeks. In 1831 he was accredited with a special mission to Turkey, to fix the boundaries of the new kingdom of Greece, and to settle the treaty in virtue of which Otho ascended the Greek throne. He went to Madrid and Lisbon on a special mission in 1832. He had previously sat in the house of commons for Old Sarum and Stockbridge during a brief interval in his diplomatic career. In 1834 he was elected for King's Lynn, which he represented until 1841, when, having twice refused the governor-generalship of Canada, he was appointed by the government of sir Robert Peel ambassador at Constantinople. Here his influence was strenuously exerted in the cause of civilization and progress. In 1852 the Derby administration recommended the crown to confer upon him the title and dignity of viscount. When the long-standing quarrel between the Greek and Latin monks in Palestine involved the powers of Europe in the struggle, Stratford remembered how the emperor Nicholas of Russia had, from 1829 to 1853, sought to establish a predominant influence, excluding all others, over the porte, with the view of settling the future destinies of Turkey to the profit of Russia when the propitious juncture arrived. At the time when Prince Menchikoff was sent to Constantinople upon a mission from the czar, Stratford was absent in England on leave. He returned to Constantinople in April, 1853, and prepared to resist Menchikoff's demands. The keenly contested diplomatic struggle between Stratford and the Russian ambassador-extraordinary is narrated with dramatic power by Mr. Kinglake in his *Invasion of the Crimea*, who calls Stratford the "Great Eltchi." Stratford's influence with the Porte prevailed, for, to adopt the words of Mr. Kinglake, "as though yielding to fate itself, the Turkish mind used to bend and fall down before him;" and he placed on England the responsibility of a defensive alliance with the sultan against the czar. As Russia would not withdraw her troops from the principalities, the sultan declared war against Russia, and France and England came to the aid of the Porte. Stratford retired from the Turkish embassy in 1858 upon a pension. He afterwards took a frequent part in the debates of the upper house on questions of foreign policy. He was created a Knight of the Garter in 1869. In 1873 he published *Why am I a Christian?* a work on the evidences of Christianity, and in 1876 a play, *Alfred the Great in Athelney*. He died Aug. 14, 1880.

STRATFORD-UPON-AVON, a municipal borough and township of England, in the county of Warwick, and 8 m. s.w. of the town of that name, is situated on the right bank of the river Avon. Pop. '91, 8318. The town is neatly built, with wide, pleasant streets, containing numerous quaint, half-timbered houses. Some trade is carried on in corn and malt. Stratford-upon-Avon is the birthplace of Shakespeare. The house in which he was born is still preserved, and there is a Shakespeare Memorial building, including a theater and a gallery of Shakespearian paintings, and a library of rare Shakespeariana. The great poet is buried in the parish church.

STRATH, a Gaelic word signifying a broad valley, is often prefixed in the n. of Scotland to the names of rivers, as Strathearn, Strathallan, Strathnairn, Strathspey, in each of which cases it signifies the open valley through which the river flows. In such cases, however, as Strathmore (great valley), it simply signifies a valley-like depression. In the s. of Scotland, the word is not used, the Northumbrian word *dale* being used instead, as Clydesdale, Annandale, Teviotdale, Tweeddale.

STRATHAVEN, a t. of Scotland, in Lanarkshire, about a mile w. of Avon Water, and 14 m. s.e. of Glasgow. On the n. side is the picturesque ruin of Avondale castle, and from 5 to 7 m. s.w. are the battle-fields of Drumclog and Loudoun Hill. The more recently built part of the town is neat and spacious. Pop. '91, 3478, chiefly engaged in weaving and trading in cheese and cattle.

STRATHCLYDE. In the 8th c., the ancient confederacy of the Britains was broken up into the separate divisions of Wales and English and Scottish Cumbria. Scottish Cumbria, otherwise called Strathclyde, thenceforth formed a little kingdom, comprising the country between Clyde and Solway, governed by princes of its own, and having the fortress-town of Alclyde or Dumbarton for its capital. Becoming gradually more and more dependent on Scotland, it was annexed to the Scottish crown at the death of Malcolm I., on failure of the line of native sovereigns. Edgar bequeathed Strathclyde to his youngest brother David, again separating it from the crown of Scotland, which went to his intermediate brother, Alexander I. David held it throughout Alexander's reign in spite of that king's opposition, and on Alexander's death without issue in 1124, it was permanently reunited to the Scottish kingdom under David I.

STRATHMORE (the Great Valley), the most extensive plain in Scotland, is a low-lying tract extending across the country from Dumbartonshire n.e. to Stonehaven in Kincardineshire, is bounded on the n. by the great mountain-rampart of the Highlands, and on the s. by the Lennox, the Ochil, and the Sidlaw hills, and is 100 m. long and from 5 to 10 m. broad. In a stricter sense, however, Strathmore proper extends only from the neighborhood of Perth to that of Brechin in Forfar, a distance of about 40 miles.

STRATHSPEY, a Scottish dance resembling the Reel. Its name is derived from the strath, or valley of the Spey in the north of Scotland, where it was first danced. The music of the Strathspey consists of broken or dotted notes preceding longer ones known by the name of the Scotch snap, and the dance abounds in jerky motions, which call every movement of the body into play. The name of Neil Gow (1727-1807) is associated with the Reels and Strathspeys of Scotland. He was the greatest player on the fiddle of Scottish dance music, and he also collected the old Reels and Strathspeys, and other national music of Scotland. Burns wrote verses to many of the oldest Strathspeys, among which are: "Lassie wi' the lint-white locks," "Green grow the rushes, O," and "Whistle o'er the lave o't."

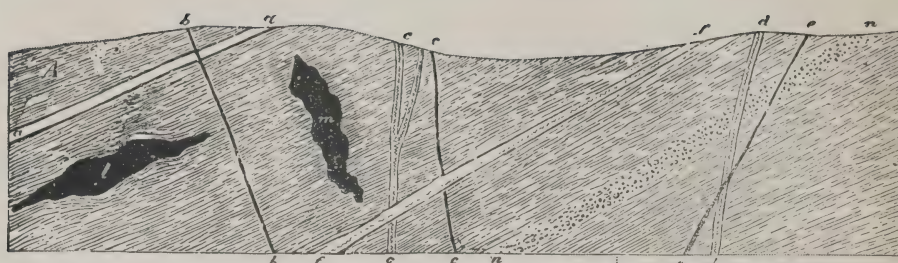
STRATIO TÊS, a genus of plants of the natural order *hydrocharideæ*, having a two-leaved spathe with numerous barren flowers, one female flower in each spathe. *S. aloides*, popularly called WATER SOLDIER, is common in lakes and ditches in the e. of England. It is a singular plant with numerous leaves, which are strap-shaped, and spring from the root, from which also springs the two-edged flower-stem, bearing the spathe with beautiful and delicate white flowers. In autumn the whole plant disappears, the root alone remaining at the bottom of the water, from which a number of young plants arise in spring, filling up ditches, so that nothing else can grow in them. It is a very ornamental aquatic plant.

STRATTON, CHARLES SHERWOOD, 1838-83; b. Bridgeport, Conn.; d. N. Y. He was engaged by P. T. Barnum, 1852, and traveled under the name of General Tom Thumb; at the time of the engagement he weighed under 16 lbs., and was not two ft. high. He was exhibited in Europe, 1854, and drew great attention. He was married to Lavinia Warren, also a curiosity of smallness, 1863, and together they traveled all over the world in company with the minute Minnie Warren and "Commodore" Nutt.

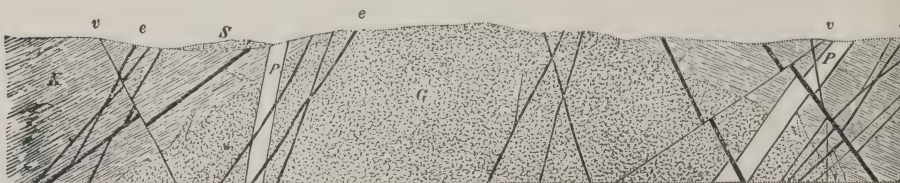
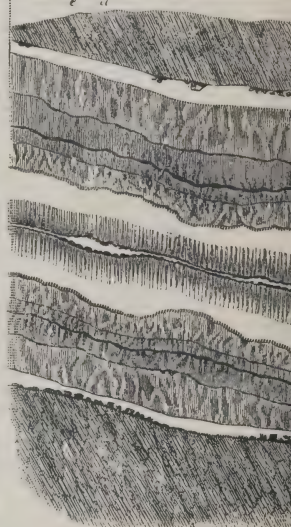
STRATUM, pl. *strata* (Lat. strewn or spread out), the term applied by geologists to the layers into which most of the rocks that form the crust of the earth are divided. It implies that the layers have been spread out over the surface, and that they were formed in this way we may infer from the deposits that are now taking place in lakes and seas into which rivers laden with muddy sediment empty themselves. •

All the aqueous rocks, which cover so large a proportion of the earth's surface, are stratified. They were formed from the abraded materials of older rocks (aqueous or igneous), which have been washed down and rearranged. The kind of rock produced depended upon the material to which the carrying agent had access. Fine mud would produce shales, sand sandstones, and calcareous matter limestones. In a section, these different kinds of rocks are frequently found to interchange within a short space. This is produced either by the water obtaining different materials, or changing its velocity. Thus the fine sediment which has fallen from slowly flowing water may be covered by a layer of sand brought down by a flood, and this again may have spread over it a covering of shells and corals, and such changes may go on alternately for an

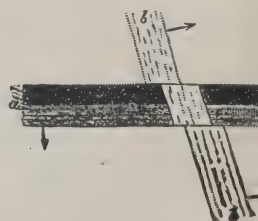
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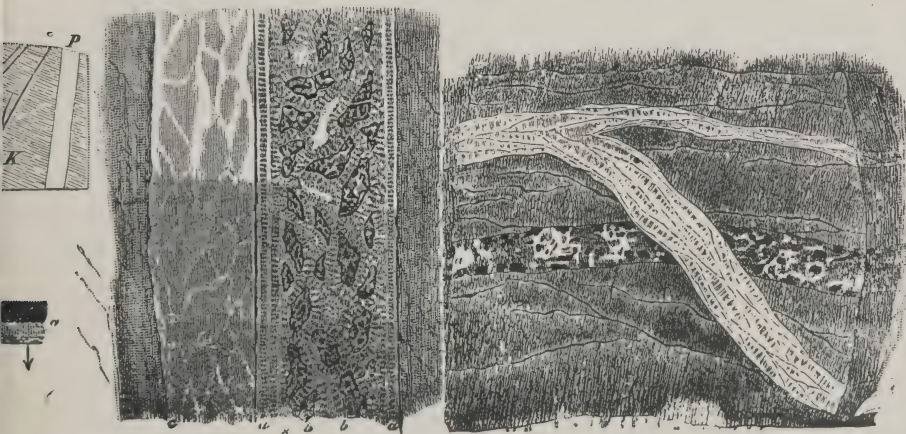
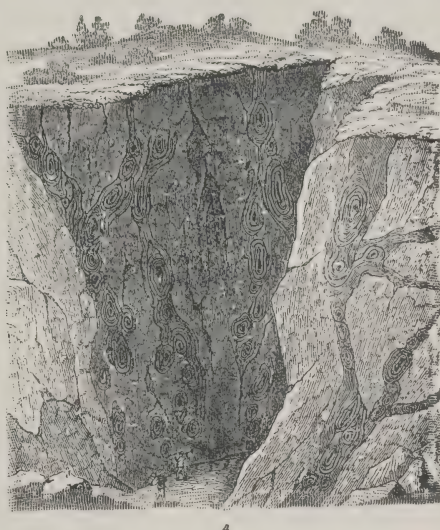
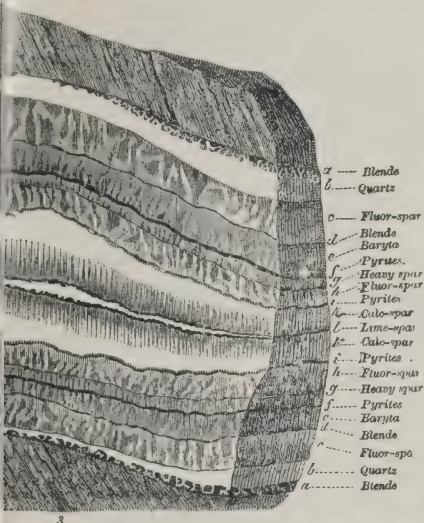
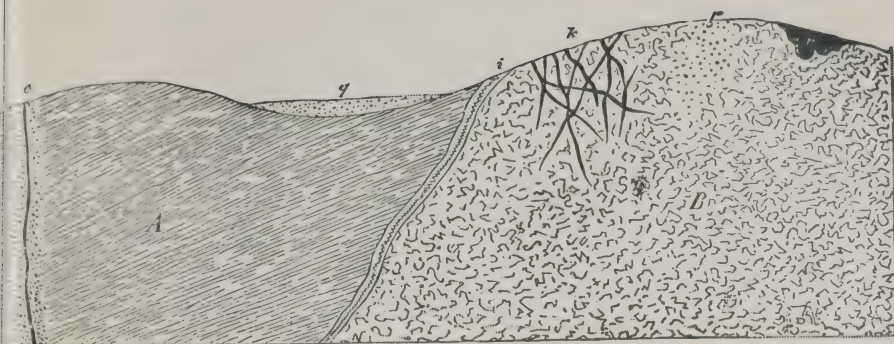
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STRATA—I. Various forms of ore-deposits; A, Laminated; B, Concrete; *b, c, d, e*, common impregnation; *o*, transverse impregnation; *p*, pocket-formed impregnation; *g*, budded gneiss. 3. Freiberg gangue with symmetrical laminated structure. 4. Gangues i at Freiberg. 6. Ideal section of Cornwall mine. 7. Deposit of auriferous soap-stone



veins and streaks; *f*, lode; *i*, branch; *k*, reticulated veins; *l*, *m*, pockets; *n*, laminated
r, placer. 2. Part of a Freiberg lode; *a*, sulphides, sulphates, and sulphurets; *b*, quartz;
granular limestone at Monte-Calvi, in northern Italy. 5. Prolonged and displaced gangue
the Ural. 8. Double gangue at Freiberg. 9. Run and ramification of gangues at Freiberg.

indefinite period. Each of the different beds composed of the same kind of material is called a stratum. Thus, in the series mentioned, there would be a "stratum" of clay, one of sand, and then one of calcareous matter. An assemblage of strata having a common age is called a "formation," and this term is also extended to rocks which agree in their composition or origin. Thus, we speak of stratified and unstratified, aqueous and igneous, fresh-water and marine, primary and secondary, metalliferous and non-metalliferous formations. As a formation is composed of many different beds, so a stratum is frequently made up of several "laminae" or "layers." The laminae have a more or less firm cohesion, but the strata easily separate from each other. Sometimes the cohesion of the laminae is so great that it is as easy to split the rock against as with the grain. In such compact rocks the lamination is obscure, or altogether imperceptible in fresh specimens, but whenever they are exposed to the influence of the weather, it becomes obvious. The laminae have been produced by short interruptions in the deposition, similar to what might be the result of tidal or other intermittent action. The degree of cohesion may be the result of rapid succession in the acts of deposition, but it is frequently produced by metamorphic action subsequent to deposition. The planes of stratification want the complete coalescence characteristic of lamination; when the contiguous layers are closely united, it is the result of the adhesion of two bodies, and not of their coalescence into one. In addition to accompanying illus., see GEOLOGY, vol. VI.

STRAUBING, a t. of Lower Bavaria, on the right bank of the Danube, 25 m. s.e. of Ratisbon, lies in a very fertile valley, and carries on a river-trade in corn, cattle, and horses. There is a monument to Agnes Bernauer (q.v.). Pop. '95, 15,596.

STRAUSS, DAVID FRIEDRICH, author of the famous *Leben Jesu*, was b. on Jan. 27, 1808, at Ludwigsburg, in Würtemberg. His education was begun in his native town, and completed in the theological seminaries of Blaubeuren and Tübingen. In 1830, his head filled with Hegel's philosophy and Schleiermacher's theology, he entered on the simple life of a country pastor, but already in the following year he was in Maulbronn acting as professor in the seminary, and went thence to Berlin for six months to continue his Hegelian studies, and hear the lectures of Schleiermacher. Returning to Tübingen in 1832, he became *repetent* in the theological seminary, and in the next years held also philosophical lectures in the university as a disciple of Hegel. Known as yet only to a narrow circle, he became all at once a man of mark by the publication, in 1835, of his *Life of Jesus critically treated*; translated into English by George Eliot in 1846. In this work, written from the point of view of a Hegelian philosopher, and designed only for the learned, he attempted to prove the received gospel history to be a collection of myths gradually formed in the early Christian communities, and, sought by an analytical dissection of each separate narrative, to detect, where it existed, a nucleus of historical truth free from every trace of supernaturalism. The book made a real epoch in theological literature, and produced a violent excitement in and out of Germany, calling forth numberless replies from opponents, frightening many by its bold disregard of consequences back into the ranks of orthodoxy, and stirring up others to similar investigations. The first consequence to the author was his dismissal from his academical position in Tübingen, and transference to the lyceum of Ludwigsburg. He resigned the new post, however, very soon in 1836, and retired into private life at Stuttgart, to have leisure to defend himself. In 1837 he published his *Streitschriften* against his opponents; and in 1838 *Zwei friedliche Blätter*, a more conciliatory exposition of his views. Early in 1839 he was called by the board of education in Zürich to be professor of dogmatics and church history in the university; but the step raised such a storm of opposition among the public that the proposition had to be dropped, and even the government itself had to resign in the same year. Thrown back on his literary labors, Strauss, who had published during the year his *Charakteristiken und Kritiken*, sent forth shortly afterward his second great work, *Die Christliche Glaubenslehre*, a review of Christian dogma "in its historical development and its struggle with modern science" (Tüb. 1840-41). This formed a natural sequel to the purely critical investigation of the origins of Christianity in the first work. When Strauss, after a long period of silence, next appeared on the literary field, it was no longer as a professed theologian. In 1847 he drew attention by a work entitled, *Der Romantiker auf dem Throne der Cäsaren, oder Julian der Abtrünnige*, full of direct allusions to the political situation of the day. His fellow-townsmen put him forward as a candidate for the German revolutionary parliament of 1848, but he was unable to stand against the clerical influence brought to bear upon the country-people of the district. His speeches on this occasion were published under the title of *Seix Theologico-political Popular Addresses*, and his native place compensated the defeat by sending him as its representative to the Würtemberg diet. From this position, however, when he unexpectedly displayed conservative leanings, and incurred a vote of censure from his constituents, he retired before the end of the year. A life of the Swabian poet Schubart (1849), and another biographical work, *Christian Märklin, a Picture of Life and Character from the Present* (1851), giving an insight into his own mental development, were his next literary efforts, before another period of silence. His third period of activity was opened in 1858 by a remarkable life of the reformer, Ulrich von Hutten (Eng. trans. 1874), followed up by the publica-

tion of Hutten's *Dialogues* in 1860. These books, though primarily of strictly historical interest, were nevertheless calculated for the present state of religious affairs in Germany, and contained fiercely contemptuous denunciations of the tactics of the reactionary party in the church. A collection of miscellaneous *Minor Writings* appeared in 1862, and a new *Life of Jesus, composed for the German people*, in 1864 (Eng. trans. 1865). The title of the work indicates its popular cast, the peculiar features of it being a long critical statement of the labors of others in the same field down to the present day, and an attempt to construct a life out of all the positive results that have been gained. The mythical hypothesis is retained, but applied differently. Still later publications which appeared in 1865 are *Der Christus des Glaubens u. der Jesus der Geschichte* (Berlin), a criticism of the newly published lectures of Schleiermacher on the life of Jesus, and a brochure, *Die Halben u. die Ganzen*, directed against Schenkel and Hengstenberg. The polemic against Schenkel, professor of theology in Heidelberg, a leader of the liberal party in the church of Baden, and author of the *Charakterbild Jesu* (1864), arose out of an earlier notice of this book by Strauss. In 1872 he published his last work, *Der alte und der neue Glaube*, in which he endeavors to prove that Christianity as a system of religious belief is practically dead, and that a new faith must be built up out of a scientific knowledge of nature. Strauss died in 1874. An edition of his collated works (*Gesammelte Schriften*) began to be published in 1876. The literary, critical, and polemical powers of Strauss must be pronounced to be of the highest order. No more effective German prose than his has been written since Lessing.—See *Life of Strauss*, by E. Zeller (Eng. trans. 1874).

STRAUSS, JOHANN, 1804-49, b. Vienna; was a member of Lanner's orchestra, and then gave concerts with a band he organized in the principal cities of Germany. His three sons have become known as composers of dance music. The eldest son, **JOHANN, b. 1825**, is music director at Vienna to the emperor of Austria. He organized a band which played with great success in all the large European cities. In 1872 he came to the United States to conduct an orchestra of 1000 performers in his own compositions at the Boston Peace Jubilee. He has composed, besides his well-known waltzes, many operettas, among others: *Indigo* (1871); *Die Fledermaus* (1874); and *Cagliostro* (1875); *La Tsigane* (1877); *The Queen's Lace Handkerchief* (1881); *The Merry War* (1881); *A Night in Venice* (1883); *The Gypsy Baron* (1885); *Ritter Pasman* (1892). The second son, **JOSEF, 1827-70, b. Vienna**, composed about 300 pieces of dance music.—**EDUARD**, the youngest son, is the leader of an orchestra in Vienna, and has composed about 200 pieces.

STRAW BAIL. See **BAIL**.

STRAWBERRY. *Fragaria*, a genus of plants of the natural order *rosaceæ*, suborder *roseæ*, tribe *potentillidæ*, remarkable for the manner in which the receptacle increases and becomes succulent, so as to form what is popularly called the fruit; the proper fruit (botanically) being the small *achenia* which it bears upon its surface. The genus differs from *potentilla* (q.v.) chiefly in having the receptacle succulent. The calyx is 10-cleft, the segments alternately smaller; the petals are five; the style springs from near the base of the carpel. All the species are perennial herbaceous plants, throwing out runners to form new plants; and the leaves are generally on long stalks, with three leaflets, deeply toothed. One South American species has simple leaves. Only one species, the **WOOD STRAWBERRY**, (*F. vesca*), is truly a native of Britain. It is common in woods and thickets. Its fruit is small, but of delicious flavor. Another species, the **HAUTOIS STRAWBERRY** (*F. elatior*), is not unfrequently to be seen in woods and hedges, but has probably escaped from gardens. It is really a native of North America. The many kinds cultivated in gardens are regarded as varieties of these species, and of the **CAROLINA STRAWBERRY** (*F. Caroliniana*), the **PINE STRAWBERRY** (*F. grandiflora*, or *F. ananas*), and the **CHILI STRAWBERRY** (*F. Chilensis*), American species, the leaves and fruit of which are larger than those of the wood strawberry. In no genus, however, are the species more uncertain to which the cultivated kinds are to be referred. Some of these are remarkable for the large size of the fruit. New varieties are continually coming into notice, and the utmost care is necessary to keep the larger and finer varieties from degenerating. The cultivation of the strawberry is most extensively carried on in Britain and in Belgium. New kinds are produced from seed; but plantations of strawberries are generally formed of the young plants, which are abundantly produced by runners. The rows are from 18 in. to two ft. apart, according to the kind. The finest fruit is said to be produced when the plants are kept distinct from each other in the rows, but this is not generally done. Tiles are sometimes placed around the plants and under the fruit; and it is an old English practice to lay straw between the rows, to preserve the fruit from rotting on the wet ground, from which the name strawberry has been supposed to be derived; although more probably it is from the wandering habit of the plant, *straw* being a corruption of the Anglo-Saxon *stræ*, from which we have the English verb *stray*. Strawberry beds require to be renewed after a few years. Strawberries are often forced in hot-houses, in order to produce the fruit at a very early season. The uses of the strawberry as a dessert fruit and for preserves are well-known. There is no more wholesome fruit.

The **ALPINE STRAWBERRY** (*F. collina*), a native of Switzerland and Germany, differs considerably from the other kinds in its taller stems and more erect manner of growth.

The fruit, which is either red or white, is not very large, but is produced in great abundance, and unlike other strawberries, parts from its calyx almost on being touched. The Alpine strawberry continues to produce fruit long after the other kinds.

The **INDIAN STRAWBERRY** (*F. Indica*), a native of the Himalaya, requires only a little protection in Britain from severe frost, and with this care grows luxuriantly and produces fruit in abundance. The flowers are yellow, not white, as in other strawberries, and are not produced upon common flower-stalks rising from the center of the plant as in the other species, but upon single-flowered stalks, which spring from the axils of the leaves upon the runners. The fruit is very beautiful, growing with its apex upward. It is not, however, of good quality.

STRAW-MANUFACTURES. The industrial applications of the straw of wheat are of great commercial importance, especially that of plaiting, which is one of the oldest arts practiced by mankind, many specimens having been found in the tombs of the ancient Egyptians, and mention being made of plaiting by Herodotus and other early writers. The earliest notice we have of its systematic use in Europe as an article of clothing is in the records of the reign of Mary, queen of Scots, who, we are told, observed that the peasants of Lorraine wore hats made of straw plait, and that this manufacture was beneficial to them, and she consequently conceived the idea of introducing it into Scotland, which was done about the year 1562, but without much success. Her son, James I., however, carried it into England, where it soon thrived, and has been from that time a permanent branch of industry. It was first regularly established in Bedfordshire, which has ever since been the chief seat of the trade.

At first, the plait was what is called *whole straw*; that is, the straw was cut into suitable lengths without knots, and merely pressed flat during the operation of plaiting, and so it continued until the reign of George I., when it was in great demand for ladies' hats, and some plait was made of split straw. Since that time, this kind has been chiefly used, and a much improved method has been substituted for the clumsy one of using a common knife for splitting it. The instrument now employed is made of steel, and consists of a number of little square blades set in a circular manner around a stem, which at one end terminates in a point, and at the other is bent and fixed into a handle. The point being inserted into the hollow of the straw, is pressed forward, and cuts it into as many strips as there are blades in the cutting-tool; these vary in number according to the fineness of the work to be produced.

It is found that the fine straw-plaiting, which is now produced better in England than in any other country except Italy, can only be made from one or two varieties of wheat, that called the White Chittim being generally preferred, and next to it the Red Lammas, which only succeed as a straw-crop upon the light rich soils of the more southern of the midland counties. The harvesting is a matter of great anxiety, as the straw is liable to many injuries from wet and other causes. The value of this crop can be best understood by the fact that an acre will yield from 25 to 40 bushels of wheat, and from 15 cwt. to a ton of straw, which, when in good condition, is worth \$35 or \$40.

The crop is bought up by straw-factors, who employ people to draw the straw, and remove the ears, which are all cut off by hand for threshing. The straws are afterward cut into lengths and cleared of the outer sheath or leaf; they are then sorted into various thicknesses by an apparatus consisting of a series of sieves about eight inches in diameter; the boys who usually do this work hold a handful on end over the first sieve, which has the narrowest spaces, and the thinnest straws only fall through it; they are next placed on the second, and so on to the last. As they fall through each successive sieve, they pass down through hollow shafts, through shoots of tin or sheet-zinc into boxes, from which they are removed and tied into bundles ready for the splitters, who next take them in hand and reduce them to strips of the sizes required. In Switzerland straw-plaiting schools exist even in the poorest parts of the subalpine districts, and their products command markets in all parts of the world. The higher instruction extends to the cultivation and acclimatization of various kinds of foreign grasses furnishing all qualities of straw.

Besides its value for plaiting, straw is now much used in the manufacture of paper (q.v.).

In America, it is recorded that from a very early period in the colonial times, the plaiting of straw and its manufacture into suitable goods for domestic use was a common home industry in many New England and other northern households. As these goods were necessarily crude and ungraceful, the wants of the wealthier classes were usually supplied by importation from abroad—principally from Italy. In the early part of this century, however, when the prolonged European wars cut off communication with Italy, more attention began to be paid to this branch of industry, and various manufactories were started which supplied a limited and local trade. But it was not until 1825–30 that the business grew to any real importance or covered any great extent of territory. About that time some of the more enterprising New York and Massachusetts houses sought to develop their facilities so as to reach those portions of the country where straw goods were little known, and the business soon assumed immense proportions. For many years goods were made largely from the straw raised and plaited in this country—the plaiting being done chiefly by females during the intervals of household work—but the cheapness and superiority of foreign braids, in

some cases, again drove this form of American labor out of the market. The chief domestic braids now left are the "Mackinaw" straw, which is raised and plaited in Canada and in a few localities in the north-western states, and the palm-leaf, grown in Cuba and split and braided in New England. More than 50 per cent of all the straw goods manufactured in this country are made from the Canton straw imported from China. The Luton straw from England, and the Leghorn from Italy, are also largely used, and small quantities of other varieties are imported from Switzerland, Bohemia, France, Malaga (Spain), Manila, and Central and South America. The total value of the importations is estimated at about \$2,000,000 annually. Straw hats and bonnets are sewn chiefly by the Knowlton and Bosworth sewing machines, which are run by steam and which can turn out as many as 100 hats each in a day. These machines are of American invention and their use is gradually extending abroad. The goods are pressed and blocked into shape at the rate of four a minute, by another machine of American origin. The total value of the straw goods manufactured in the United States was, in 1870, \$7,282,086, and in 1880, \$9,345,759. According to the census of 1890 there were six establishments manufacturing straw goods, exclusive of hats, in the United States. These are distributed between the Dist. of Columbia, Indiana, Iowa, Kentucky, Maine, Maryland, Minnesota, Tennessee and Virginia. The aggregate capital employed in these manufactures is \$106,750, the number of hands employed 433, and the annual value of their products \$214,257. The imports of manufactured straw into the United States for the year ending June 30, 1895, amounted to \$1,283,429, and of unmanufactured for the same year \$24,544.

STRAZNICKY, EDWARD R., PH.D., 1820-76; b. Moravia; graduated at a university in Vienna, where he became an expert linguist, and took the degrees of M.D. and PH.D. He was made intendant of an estate belonging to a wealthy Austrian nobleman, but, becoming involved in the struggle of Hungary for liberty, was compelled to leave his country, notwithstanding the fact that one of his near relatives was a field-marshal in the Austrian service. He arrived in New York penniless, and was forced to submit to severe privations during his first years in America. His ability and education, however, at length secured him influential friends, and he was made secretary of the American geographical society, and in 1859 second assistant librarian in the Astor library. He rose through the different grades until, on the retirement of Hon. Francis Schroeder, superintendent of the library, he was appointed to that position.

STREATOR, a city in Lasalle co., Ill., on the Vermillion river and the Atchison, Topeka, and Santa Fé, the Burlington route, the Chicago and Alton, the Indiana, Illinois, and Iowa, and the Wabash railroads; 16 miles s. of Ottawa, the co. seat. It is in an agricultural, coal-mining, and valuable clay region; contains a high school, Y. M. C. A. building with hall, reading-room, and gymnasium, opera house, public library, several national banks, and about 25 churches; and has manufactories of paving and fire brick, sewer pipe, tile, plate, window, flint, and fancy glass, glass bottles, machinery, flour, etc. Pop. '90, 11,414.

STREET, ALFRED BILLINGS, 1811-81; b. N. Y.; studied law and practiced a few years at Monticello, N. Y., but after 1838 lived at Albany. He wrote many poems of considerable merit, some of which have been translated into the German. Among his writings were: *The Burning of Schenectady, and other Poems* (1842), and *Frontenac, a Tale of the Iroquois in 1696* (1849). In prose, he wrote biographical and historical sketches, *Forest Pictures in the Adirondacks* (1864), and *The Indian Pass* (1869). He was for many years state librarian.

STREET, AUGUSTUS RUSSELL, 1791-1866; b. New Haven, Conn.; graduate of Yale college, 1812; studied law; inherited a large estate; gave \$300,000 to Yale college, founding the Street professorship of modern languages. He erected, and partially endowed, the Yale school of fine arts, and left a sum of money to establish the Titus Street professorship. He lived in Europe, 1843-48; returned to this country and died in New Haven. His daughter married Admiral Foote.

STREET, GEORGE EDMUND, b. England, 1824; educated at the collegiate school, Camberwell, and afterward studied architecture under Gilbert Scott. Among his works are the theological college at Cuddesden, and the churches of St. Philip and St. James, at Oxford, and of St. Margaret, at Liverpool. Among his restorations are Jesus college chapel, Oxford; and Wantage church. Most of his works are in the Gothic style, upon which he has written much. Among his writings are *The Brick and Marble Architecture of North Italy in the Middle Ages* (1855), and *Gothic Architecture in Spain* (1865). D. 1881.

STRELITZ, more properly *streltzi* (arquebusiers), the ancient Russian militia guard, first raised by Ivan Vassilevitch the terrible, in the second half of the 16th century. At that time, and for long afterward, they were the only standing army in Russia, and at times amounted to between 40,000 and 50,000 men. They were located at Moscow in time of peace, in a quarter of the capital which was set apart for them, and, being the bravest and most trustworthy troops in the army, were made objects of special favor and distinctions. But like all such petted corps, the Roman pretorians, the Turkish janizaries, and the Egyptian memluks, their general turbulence, frequent revolts against the government (notably during the Demetrian insurrections), and incessant conspiracies

rendered them more formidable to the Russian government than to external enemies. The strelitz having, at the instigation of the grand-duchess Sophia and the chiefs of the Old Muscovite party, revolted against Peter the Great, that iron-handed ruler caused them to be decimated (1698) in the great square of Moscow, and the remainder to be banished to Astrakhan. The feeble remnant still manifesting their characteristic turbulence and disloyalty, Peter exterminated them almost completely in 1705. Few Russian families at present can claim kindred with the old streltzi, but to this the family of Orloff (q.v.) forms a prominent exception, being descended from a strelitz who was pardoned by Peter the Great while the axe was being raised over him.

STRENGTH OF MATERIALS. The strength of materials depends upon their physical constitution—viz., their form, texture, hardness, elasticity, and ductility.

The resistance of materials in engineering works is tested in reference to various strains; such are—1. Extension or tension; 2. Compression or crushing; 3. Transverse or cross strain; 4. Shearing strain; 5. Torsion or twisting strain.

1. *Extension.*—When a rod is suspended vertically, and a weight attached to its end tending to tear it asunder, all its fibers act equally, and its strength evidently depends on the strength of the individual fibers and their number, that is, the area of cross-section of the rod. The following table gives the resistance to *rupture* of some of the most common materials:

| | Per Square Inch. |
|------------------------------------------------------------|------------------|
| Fine sandstone..... | 200 lbs. |
| Brick..... | 300 “ |
| Common lime..... | 50 “ |
| Portland cement..... | 240 “ |
| Deal (timber)..... | 5 tons. |
| Cast iron (ordinary)..... | 6½ “ |
| “ Stirling's toughened..... | 12½ “ |
| Wrought iron, boiler-plate..... | 20 to 24 “ |
| “ bars..... | 25 “ |
| Cast steel..... | 60 “ |
| Ropes (hemp), four-fifths ton per pound weight per fathom. | |

With regard to the elongation of materials under tensional strain, it has been observed that up to a certain limit, which is different for different substances, the elongation is proportional to the extending force, a physical truth the promulgation of which is due to Hooke (q.v.); up to this limit also the body nearly recovers its original form on the removal of the force; this limit is called the limit of elasticity. When this limit is passed, the permanent elongation or destruction rapidly increases until rupture takes place.

The extension of wrought iron is about $\frac{1}{1000}$ of its length per ton of strain per square inch, and that of cast iron $\frac{1}{8000}$. The limit of elasticity of wrought iron is attained under a strain of 12 tons per square inch; and in the case of American pine $1\frac{1}{2}$ ton per square inch.

2. *Compression or Crushing Strain.*—The strength of pieces of stone, wood, or iron, whose height is small in proportion to their area, and which absolutely crush under the strain, is proportional to the area of their horizontal section. The following table gives the resistance to crushing of some of the more common materials:

| | |
|-------------------|--------------------------|
| Cast iron..... | 50 tons per square inch. |
| Wrought iron..... | 16 “ “ “ |
| Brickwork..... | 30 tons per square foot. |
| Sandstone..... | 200 “ “ “ |
| Limestone..... | 490 “ “ “ |
| Deal..... | 450 “ “ “ |
| Oak..... | 650 “ “ “ |

Up to a certain strain, which is called the limit of elasticity, the diminutions in length of the body are proportional to the compressing force; and are practically the same in amount as the elongations in the case of tensional forces. In the case of wrought iron, the limit is 12 tons per sq.in.; after that strain, its shape and proportions become permanently altered; and where these are of consequence, as in most practical cases, we come to the limit of its utility, which is reached when the load is about 16 tons per sq. inch. It then oozes away beneath additional strain, as a lump of lead would do in a vise.

The mode of ultimate failure of cast iron is quite distinct from that of wrought iron. It crushes suddenly by the sliding off of the corners in wedge-shaped fragments, being a crystalline mass, without sufficient ductility to allow of its bulging horizontally; the angle of rupture at which these wedges slide off being tolerably constant, and varying from 48° to 58°. The limit of elasticity is attained in cubes of deal under a compression of 100 tons per sq.ft.; and in those of oak, 150 tons per sq. foot.

Pillars, round or square, may be divided into three classes—1. Those whose height is not more than 5 times their diameter; 2. Those whose height is between 5 and 25 times their diameter; 3. Those whose height is at least 25 times their diameter. The

first follow the same laws as cubes or pieces of small height above discussed, and are absolutely crushed; their strength being proportional to their cross section. The second are broken across, partly by crushing and partly by bending. The third give way purely from bending as with a transverse strain, and their strength is found by experiment to be directly proportional to the fourth power of their diameter, and inversely proportional to the square of their length. Thus, in the case of two long pillars of equal length, but of which one has its diameter double that of the other, the strength of the former will be 16 times that of the latter; from which will be apparent the advantage of the tubular form for pillars, as it gives a large diameter, combined with lightness.

In the case of long columns whose length is 25 or more times their diameter, if we represent the strength of a long cast-iron column of any dimensions by 1000, the strength of a wrought iron column of the same dimensions will be 1750; of cast steel, 2,500; of Danzig oak, 110; of red deal, 80.

3. *Transverse or Cross Strain*.—When a beam fixed at one end is loaded with a weight at the other, it is bent from its original form, and takes a curved shape. The fibers on the upper or convex side of the beam are extended, and those on the under or concave compressed; while at the middle of the beam, there are fibers which are neither extended nor compressed, where the compression ends and the extension begins: this surface of fibers is called the neutral surface. As long as the beam is not strained beyond the limit of its elasticity, the extensions and compressions for a given strain are nearly equal, and therefore the neutral surface passes through the center of gravity of the cross section of the beam.

If we strain the beam beyond this limit, and approach the breaking strain, the extensions and compressions are no longer equal, and therefore the position of the neutral surface is not readily determined. For example, in the cases of stone and cast-iron, the amount of compression is much less than that of the extension, and in the case of timber greater. Also the extensions and compressions are no longer proportional to the strains. From these causes the position of the neutral axis, and the amount of strain on the different parts of the cross section at the moment of rupture, cannot be determined by theory.

Different theories have been proposed to determine the relative strength of similar beams, while their absolute strength is left to experiment. That of Galileo consists in supposing the beam incompressible, and that it gives way by extension turning round the lower edge, each point of the section giving an equal resistance before rupture. That of Mariotte and Leibnitz supposes the beam in like manner to turn round its lower edge, but considers that the resistance given out by each point of the section is proportional to its distance from that edge.

The theory now generally adopted consists in supposing the extensions and compressions to continue up to the point of rupture proportional to the strains, as is actually the case up to the limit of elasticity, and therefore, that the beam turns round a neutral axis, passing through the center of gravity of the cross section, the force given out by each point being proportional to its distance from the neutral axis. This last theory is found to give the best results in the case of timber and wrought-iron, especially wrought-iron arranged in the forms usual in girders. The second represents nearly the method of failure of stone, and the first that of cast-iron.

Though none of these theories give accurate results, they yet give us means of determining, from particular experiments, the strength of any other beam whatever. For example, these theories agree in giving the strength of a rectangular beam to be proportional to the area of cross section multiplied by the depth, and inversely proportional to the length of the beam, since the strain increases directly as the length. This, when expressed mathematically, is

$$W = C \frac{bd^2}{l} \quad (\text{I.})$$

Where w = breaking weight in tons.

b = breadth of beam in inches.

d = depth of beam in inches.

l = length of beam in inches.

C = a constant number for beams of the same material, to be determined by experiment.

This result is borne out by experiment—that is to say, the constant C being determined by experiment on one beam, the strength of any other is found by multiplying its breadth by the square of its depth and by the constant C , and then dividing by its length. In the case of a beam supported at each end and loaded by a weight in the middle, the strength is also given by the formula,

$$W = c \frac{bd^2}{l} \quad (\text{II.});$$

but c , in this case, is 4 times the value of C in the formula for a beam loaded at one end

The truth of this may be seen from the consideration that the beam may be treated as if it were two beams, each fixed at the middle point at one end, and pressed upward by the reaction of the supports at their other ends. This reaction is evidently equal to $\frac{W}{2}$; so that the breaking weight of the whole beam, supported at both ends, resolves itself into that of a beam of length $\frac{l}{2}$, acted on by the weight at one end $\frac{W}{2}$; this by formula (I.) is,

$$\frac{W}{2} = C \frac{bd^3}{l}$$

$$\text{or, } W = 4C \frac{bd^3}{l} = c \frac{bd^3}{l};$$

therefore, $c = 4C$ or $C = \frac{1}{4}c$.

Experiments on the transverse strength of beams are generally made by loading in the middle beams supported at both ends. The following table, from experiments by Mr. Barlow, gives the value of c for beams supported at each end and loaded in the middle:

| | Tons. |
|-------------------|------------------|
| Cast-iron..... | 13 $\frac{1}{2}$ |
| Wrought-iron..... | 12 |
| English oak..... | 2 $\frac{1}{2}$ |
| Red pine..... | 2 $\frac{1}{5}$ |

These numbers when substituted in the formula give the breaking weight, one-third of this will be the safe load in practice. The transverse strength of cast iron is considered so good a test of its value, that in specifications of iron work, it is generally required to be of such a quality that a bar of it, of certain dimensions, will bear a specified weight at the center; for example, "that a bar of it, 42 in. long, 2 in. deep, and 1 in. wide, set on bearings 36 in. apart, shall bear, without breaking, 30 cwt. suspended in the middle." If a beam be loaded uniformly over its length, it will bear twice as much as if the load be condensed at the center. Also if the load be placed some distance from the center, the load it will bear is to the load borne at the center inversely as the rectangle of the segments into which the beam is divided by the point of application of the load are to one another, from which it follows that it will bear less weight at the center than at any other point.

Since the strength of a rectangular beam is proportional to the square of the depth, multiplied by the breadth, it is evident that by increasing the depth and diminishing the breadth we shall, up to a certain limit, increase the strength of a beam without increasing its weight; for example, let A and B be the sections of two beams, of which A is 2 in. broad and 2 deep, and B 4 in. deep and 1 in. broad, they are of the same sectional area—viz., 4 sq. in., but the strength of B is to the strength of A as $4^2 \times 1$ is to $2^2 \times 2$, or as 16 to 8, that is 2 to 1, that is to say, B is twice the strength of A. Hence arises the advantage of the double T forms so generally used in iron girders, the strength of which forms are proportional to the area of the top or bottom plates multiplied by the depth. For a beam of this form loaded at the center, the following formula will give the breaking weight:

$$W = C \frac{ad}{l}$$

Where a = the area of the top or bottom flange in sq. inches.

C = { 4 times the destroying load per sq. in. of the material, under direct tension or compression in tons.

d = depth of the beam in feet.

l = length between supports in feet.

W = breaking weight at the center in tons.

For cast-iron beams, when the area of the bottom flange is made 6 times that of the top, which has been found by experiment to be the best arrangement, and the strength is measured by the tensional strain, supported by the bottom flange, that is, 6 $\frac{1}{2}$ tons per sq. inch.

$$C = 6\frac{1}{2} \times 4 = 26 \text{ tons.}$$

For wrought-iron beams,

$$C = 4 \times 20 = 80 \text{ tons for the lower flange,}$$

$$\text{and } C = 4 \times 16 = 64 \text{ tons for the upper flange.}$$

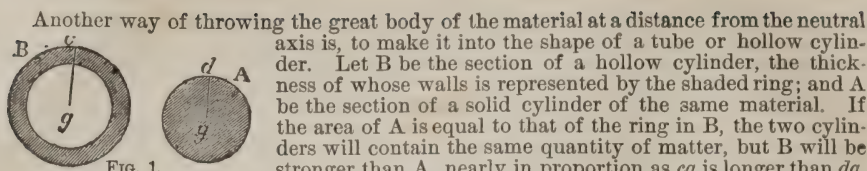


FIG. 1.

The principle of hollow structure prevails both in nature and art, wherever strength and lightness have to be combined. It is seen in the stems of plants, especially of the grasses; the bones of animals are also hollow, and those of birds, where great lightness is required, are most so. A feather, with its hollow stem, is perhaps the best instance of the union of strength and lightness that could be given. In art, again, we have hollow metal pillars; and sheet-iron for roofing and other purposes is *corrugated*, or bent into ridges and furrows, to give it depth. Each ridge or furrow is, as it were, half a tube, and resists bending with twice or thrice the energy it would if flat.

The most striking application of the principle of hollow structure is seen in tubular bridges. The object being to resist a vertical strain, the form is made rectangular, and the chief mass of the material is thrown into the top and bottom. The tube may, in fact, be considered as an immense beam or girder constructed on the principle of the double T-iron girder, the top and bottom being the two flanges, and the two sides serving to connect them instead of the one rib in the middle. As it is constructed of plate-iron, the top requires more metal than the bottom, in order to resist the compression; but instead of putting the metal into one thick plate, or into several plates, laid the one on the other, it is made to form a set of minor tubes or cells, which give additional stiffness and strength to the whole tube. The floor, in like manner, contains cells. Each of the tubes over the Conway bridge is 24 ft. high, 14 ft. wide (outside), and 420 ft. long, and weighs 1,300 tons; yet these enormous hollow beams sustain not only their own weight, but the heaviest railway-trains without sensible deflection.

Fig. 2 represents an ingenious contrivance for strengthening the wooden beams supporting a bridge. An iron rod fixed to the beam AB at the two ends, is kept at a distance by struts c, c' . The beam cannot now be bent downward without stretching the rod; which thus has to bear the tensive strain while the beam itself sustains only the compressive strain.

Another way of removing part of the strain from a girder, is to fix a king-post and two oblique pieces on its upper side. The whole is now one composite girder; and when any weight bears upon it, the whole of the compressive strain is thrown upon the oblique pieces, and only the tensive strain is left for the beam to sustain.

When a beam AB is fixed at one end, and loaded at the other, the strain is greatest at B, and is less at other points c, c' , in proportion as Ac, Ac' , the levers at which it acts, are less than AB. The beam may therefore be made to taper off toward the end, and we may determine the exact form the beam should have, in order to be equally strong at every point. For supposing the breadth uniform, the strength increases as the squares of the depths $c'd', cd$, while the strain increases as the levers Ac', Ac ; and thus, if $Ac:Ac'::cd^2$ to $c'd'^2$, the strengths are equal at those points. This proportion will always hold good, if the curve of the beam is that of a parabola; and, accordingly, this is the shape given to the beams of steam-engines.

In beams supported at both ends, the strain is greatest in the middle; girders are therefore made strongest in the middle, and taper toward the ends.

4. *Shearing Strain.*—This force is called into play when a plate is cut by shears, or when a riveted or bolted joint is torn asunder, in which case the rivets are sheared across. The effect of it is to cause the particles in one plane to slide over those in another; this is resisted by their mutual coherence, and the magnitude of the resistance depends on the number of the particles, that is on the area of cross-section of the body sheared. The following laws are the result of experiment: 1. The ultimate resistance to shearing is proportional to the area of section of the bar sheared. 2. The ultimate resistance of any bar to a shearing strain is nearly the same as the ultimate resistance of the same bar to a direct longitudinal strain.

5. *Torsion.*—If one end of the axle or shaft of a wheel is immovably fixed, and a power acts at the circumference of the wheel (or at the end of a lever or winch), the power may be so increased as to twist the shaft asunder at its weakest point. If a shaft A has twice the diameter of another shaft B, there will be four times as many fibers in the section of fracture of A, to resist the twist, as in that of B. But as the separation takes place by the one end of the fracture turning round upon the axis of the shaft, making the ends of the separating fibers describe circles, those fibers that are furthest from the center will have the greatest power of resistance, and the sum of their moments,

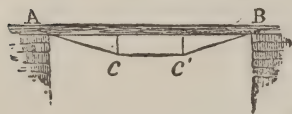


FIG. 2.

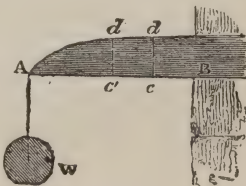


FIG. 3.

or their united effect, will be in proportion to their mean distance from the center. This mean distance in A is twice that in B; therefore, the resistance in A is 2×4 , or 8 times the resistance in B. Generally, the strength of shafts to resist torsion is as the cubes of their diameters. The torsive strengths of shafts 1 in. diameter, and with weights acting at 1 ft. leverage, being found by experiment for different materials; the strength of shafts of other dimensions is found from these "constants" by multiplying by the cube of the diameter, and dividing by the length of the lever. It is evident that the torsive strength of a hollow shaft will be greater than that of a solid one of the same quantity of material, on the same principle that its transverse strength is greater. The rule used by Boulton and Watt for calculating the diameters of their wrought-iron shafts was as follows:

$$\text{Diameter of shaft in inch.} = \sqrt[3]{\frac{120 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

This is found to make the shafts rather too light; and the following variation gives safer practical results:

$$\text{Diameter of shaft in inch.} = \sqrt[3]{\frac{240 \times \text{horse-power.}}{\text{Revolu. per minute.}}}$$

STREPSIPTERA (Gr. twisted-wings), an order of insects called RHAPIPTERA (Gr. fan-winged) by Latreille, but first established by Kirby. The first-known species were observed by Rossi, and referred by him to the order *hymenoptera*. The order strepsiptera consists of a small number of species, very singular in structure and habits, apparently forming a connecting link between *coleoptera* and *hymenoptera*. The species are all small, and in their larval state, live parasitically in the bodies of bees and wasps. Their natural history has been the subject of much attention since they were discovered; but much still remains obscure. The species form the two genera, *stylops* and *xenos*.

STRETCHING-COURSE, in masonry or brick-work, is a course in which the stones or bricks are placed with their longest sides along the face of the wall. The stones are called *stretchers*, as those placed at right angles to them with their end exposed are called *headers*.

STRETTO (Ital. bound), in music, a term which signifies that the movement to which it is prefixed is to be performed with rapidity gradually accelerating toward the close.—The term *stretto* is also applied to the recurrence in a fugue of the subject in one part before it has come to a close in another. See FUGUE.

STRIÆ, the fillets between the flutes of columns, pilasters, etc.

STRICKLAND, AGNES, an English authoress, the daughter of Thomas Strickland, esq., was b. at her father's seat, Roydon Hall, near Southwold, in Suffolk, in the year 1806. She was the third daughter of a family of six daughters and two sons, nearly all of whom have contributed something to the literature of our time. Her first compositions were mostly in the poetical vein, and consisted of anonymous contributions to periodicals. About the year 1825, however, she published, in conjunction with her sister Susanna (afterward Mrs. Moodie), a volume of *Patriotic Songs*; which was followed, in 1826, by a little volume bearing her own name exclusively, and entitled *Worcester Field, or the Cavalier; a Poem, in Four Cantos, with Historical Notes*, which was favorably received by some of the reviews. *Worcester Field* was followed by *The Seven Ages of Woman, and other Poems* (Lond. 1827); and this by *Demetrius, a Tale of Greece, in Three Cantos* (Lond. 1833), written in the meter of Byron's *Coriair*. In 1836 she published a little volume entitled *Floral Sketches, Fables, and other Poems*; republished in 1861. With this the list of Miss Agnes Strickland's poetical works ends. Among her prose works are: *The Rival Crusoes*, published without date; *The Pilgrims of Walsingham, or Tales of the Middle Ages, an Historical Romance* (2 vols., 1835); *Tales and Stories from History* (1836); *Alda, the British Captive* (1841); *Historical Tales of Illustrious British Children* (1847; new ed., 1858); *Historic Scenes and Poetic Fancies* (1850); *Old Friends and New Acquaintances* (2 series, 1860–61). All these, however, are but of small import in comparison with her well-known work, *Lives of the Queens of England from the Norman Conquest, with Anecdotes of their Courts*, in 12 vols. (Lond. 1840–48; new ed., 8 vols., 1851–52). In this work, the materials for which she discovered by diligently ransacking among the treasures of the British Museum and other great public repositories of historic documents, Miss Strickland was largely assisted by her sister Elizabeth, an assistance which she gratefully acknowledges in her preface. It was dedicated to queen Victoria; and as each volume successively appeared, its picturesque style and anecdotal character made it a general favorite, especially among that class of readers whose object in reading history is rather amusement than philosophical instruction. At the same time it must be owned that in these *Lives* she has added materially to our stock of historical information. Miss Strickland's *Lives of the Queens of England*, concluding with the biography of Queen Anne, have been followed by the *Lives of the Queens of Scotland, and English Princesses connected with the Regal Succession of Great Britain*, in 8 vols. (Edin. and Lond. 1850–59); and these by her *Lives of the Bachelors Kings of England* (Lond. 1861), containing the lives of William Rufus, Edward V., and Edward VI. Miss

Strickland published a novel entitled *How will it End?* (1865); *Lives of the Seven Bishops* (1866). In 1871 she received a pension of £100. She died in July, 1874.

STRICKLAND, HUGH EDWIN, 1811-53; b. England; studied with Dr. Arnold at Laleham; graduate of Oxford, 1832; gave his attention to the special study of geology and ornithology. In 1850 he became reader in geology in the university of Oxford, succeeding Dr. Buckland, and retaining the post till his death. He was one of the founders of the Geological Society, and of the Ray Society, which on account of his representations undertook the publication of Agassiz's *Bibliographia Zoologie et Geologie*, 3 vols. of which he edited. He contributed to scientific periodicals, and was associated with Sir Roderick Q. Murchison in his *Silurian System*.

STRICT CONSTRUCTIONISTS. See PARTY NAMES.

STRICTURE is a term employed in surgery to denote an unnatural contraction, either congenital or acquired, of a mucous canal, such as the urethra, œsophagus, or intestine. When, however, the affected part is not mentioned, and a person is stated to suffer from stricture, it is always the urethral canal that is referred to. Contraction of this canal may be either permanent or transitory; the former is due to a thickening of the walls of the urethra, in consequence of organic deposit, and is hence termed organic stricture; while the latter may be due either to local inflammation or congestion, or to abnormal muscular action: the first of these varieties may be termed inflammatory or congestive stricture; and the second, spasmodic stricture. The last-named form seldom exists except as a complication of the other kinds of stricture. There are two principal causes of organic stricture—the first being inflammation of the canal, and the second injury by violence. Inflammation is by far the most common cause, and gonorrhœa is the common agent by which it is excited. Not unfrequently, stimulating injections thrown into the urethra, with the view of checking the gonorrhœal discharge, excite an inflammatory action, which gives rise to stricture. Fortunately, it is only in exceptional cases that a stricture results from inflammation of the urethra, the inflammation, in the great majority of cases, terminating by resolution, and leaving the canal as healthy as before the attack. It is when the complaint assumes a chronic character that it most commonly lays the foundation of stricture. Stricture from the second cause arises from such cases as falling across spars, scaffolding, ladders, etc., or on some sharp object which punctures the perineum, as from earthenware vessels which break under the sitter.

The earlier symptoms of stricture are a slight urethral discharge and pain in the canal, behind the seat of the stricture, at the time of micturition. The stream of urine does not pass in its ordinary form, but is flattened or twisted; and as the disease advances, it becomes smaller, and ultimately the fluid may only be discharged in drops. The straining efforts to discharge urine often induce tenesmus (q. v.).

As the case advances, the urine becomes alkaline and ropy, and deposits a precipitate when allowed to stand; and attacks of complete retention (q. v.) occur with increasing frequency. But these symptoms are not in themselves sufficient to establish the presence of stricture. It is necessary to examine the urethral canal with a catheter (q. v.) or bougie (q. v.), to ascertain whether an organic obstruction exists, whether one or more strictures are present (as many as eight have been recorded, although four are rare; and one is the most common number), and their caliber. The treatment of organic stricture is too purely surgical to be discussed in these pages: it is sufficient to state that its object is twofold, viz., first, to restore the natural caliber of the canal, so far as this can be safely effected; and, secondly, to maintain this patency, after it has been established.

Spasmodic stricture may occur from any of the following causes: The presence of organic stricture or of inflammation of the mucous membrane; from an acrid condition of the urine; from the administration of cantharides, turpentine, etc.; and from the voluntary retention of urine for too long a time. The treatment consists in the removal of the causes as far as possible, and the hot bath. The inhalation of chloroform sometimes gives immediate relief; and several cases are recorded in which, when the spasm occurred periodically, it was cured by quinine. Inflammatory or congestive stricture commonly arises when a recent purulent discharge from the urethra has been checked by external cold or wet. The patient complains of heat, fullness, and soreness in the perineum; the passage of the urine is extremely painful, the stream being small, and ceasing before the bladder empties. The treatment is much the same as that for retention of urine (q. v.).

STRIGAU, or **STRIEGAU**, a t. of Silesia, Prussia, situated on Strigau Water, 32 m. w.s.w. of Breslau. It has manufactures of woollens and linens. It is famous for the victory gained by Frederick the Great over the Austrians and Saxons in 1745. Pop. '95, 12,627.

STRIGIDÆ, the family of nocturnal birds of prey, or owls (q. v.).

STRIKE, a term borrowed by geologists from the German *streichen*, to extend, and adopted with the technical meaning it has in that language. It is applied to the direction of the outcrop of a stratum—the line which it makes when it appears on the surface of the earth. This line is always at right angles to the dip of the bed. The angle of dip and the direction of strike are determined by a clinometer and compass. A perfectly horizontal stratum can have neither dip nor strike.

STRIKES. Beginning as early as the middle of the 14th c., the opposition of combined labor to the efforts of employers to regulate the price and hours of labor, has been prominent in economic history; though, indeed, the earliest incident recorded in such history, had a peculiar origin, the reverse of what we have just indicated. The terrible plague of 1348 which continued during eight years, destroyed, it is believed, nearly two-thirds of the human race then existing. In London, 50,000 bodies were buried in one grave-yard; in Venice the number of deaths is said to have been 100,000; in Lübeck 90,000; in Spain the disease raged three years, and carried off two-thirds of the people; in the east 20,000,000 perished in one year. One result of this protracted "dance of death" was a scarcity of labor so great that it became a question as to the possibility of providing for the living. Such a condition, not unnaturally, encouraged the craftsmen to increase the price of their services, with the increase of the demand and of the scarcity. In England this assertion of a claim which could not but be obnoxious, was met by parliamentary enactments, "statutes of labor," and other exercise of the power of the governing class. It was the first "strike," and, as ever since, it was met by force. It was an attempt to take unfair advantage of disaster and death. Subsequent strikes for a rise in wages have been occasioned mostly by a preceding act of cutting them down. The introduction of machinery and the factory system into British labor, was the occasion of serious resistance on the part of skilled labor; as was the case also on the continent of Europe and in America. From this time strikes have been common, whenever laborers wished an increase of wages, or a lessening of the hours of labor. The organization of trades-unions made it possible to conduct these movements on a large and powerful scale; and in many instances—particularly in flush times, and when prices were high—they were successful. Not always conducted, however, with a due regard for existing economic conditions, they have frequently proved abortive for their purpose, and powerful only in creating added and permanent distress among the laboring classes. Little record has been kept of the strikes which have occurred in America, but we know that as early as 1830 they occurred in Boston to secure shorter hours of labor; the trades engaged being carpenters and masons. Strikes have occurred since in various manufacturing towns in Massachusetts about every year; sometimes for shorter hours, sometimes for more pay. In some instances these were accompanied by rioting, and sometimes the militia were ordered out to suppress this. In 1834 several hundred laborers employed in building the Providence railroad, struck for higher wages, and became riotous. This was probably the first railroad strike. As a rule, all the early strikes were unsuccessful, though the continual effort after the "ten-hour" rule for daily labor was eventually successful. In Lowell, Lawrence, Fall River, and other cotton-manufacturing towns in Massachusetts, strikes have been frequent; many of them being accompanied by much bitterness and ill-feeling; and all resulting in serious pecuniary loss to all concerned. In all the large cities strikes have formed a prominent feature of the history of labor. Type-setters, stage-drivers, railroad-hands, shoe-makers, and nearly all trades and callings have at one time or another in the past half-century experienced these unfortunate aberrations. But the most important event of this nature, was the memorable railroad strike of 1877; when for two weeks, beginning July 14, 100,000 railroad men and 40,000 miners were "on strike" at once; 6,000 m. of railroad, covering several of the trunk lines, were in the hands of an infuriated mob; the state militia and the U. S. army were found necessary to put down the accompanying riotous conduct, murder, and incendiarism; and more than 2,000 freight cars in Pittsburg alone, with their contents, were destroyed, the destruction of railroad property being estimated at \$10,000,000; while in Chicago, Buffalo, Cincinnati, Albany, and other cities, the amount of loss has never been fully estimated. See COMBINATION, LABOR, TRADES UNIONS.

STRING-COURSE, a thin projecting course of stone or brickwork in a wall, generally ornamented with a molding, and made to go around windows or other openings in the wall.

STRINGENDO, a term used in music to denote a gradual acceleration in the time.

STRINGHALT is a peculiar catching up of the horse's limbs, usually of one or both hind limbs. It is most noticeable when the animal is first brought out of the stable, when he is excited, or made to turn suddenly round; it is a variety of chorea or St. Vitus's dance. Although a serious eye-sore, it does not interfere with usefulness, and is quite incurable.

STRINGHAM, SILAS HORTON, 1798-1876; b. N. Y.; entered the navy as midshipman, 1809; was in several actions in the *President* and *Spark*, under Decatur and Rodgers; and in 1819-21 as lieutenant in command of the *Cyane* and the *Hornet* conveyed the first settlers to Liberia and captured many slavers. He was promoted to a captaincy in 1841, and participated in the bombardment of Vera Cruz. On the breaking out of the civil war he was made flag-officer of the Atlantic blockading squadron, and the *Minnesota* was his flag-ship. He commanded the naval force which in connection with the land forces of Gen. Butler, captured Forts Hatteras and Clark. In 1862 he was retired as rear-admiral. In 1871 he became port-admiral of New York, and resided in Brooklyn at the time of his death.

STROBILA. See TAPE WORM.

STROMBIDÆ, a family of gasteropodous mollusks, of the order *pectinibranchiata*, nearly allied to *buccinidæ* (whelks, etc.) and *muricidæ*. The shell has a canal, the external lip of which, as it attains maturity, becomes more or less dilated, and is marked with a sinus, whence the head issues when the animal comes out. The foot is narrow and small, but is employed in active leaping movements, during which the shell oscillates from side to side. The species are numerous, and are mostly inhabitants of tropical seas. Some of them are among the largest of mollusks. *Strombus gigas* is the largest known univalve. It is found in the West Indies, on reefs in shallow water, and is fished both for the table and on account of the shell. Great numbers of the shells are imported into Britain; 300,000 have been brought to Liverpool in a year. They are sometimes called fountain-shell, from their occasional use as a garden ornament. Their chief use, however, is by cameo-makers, by whom they are valued for their solid and delicately tinted substance. A shell sometimes weighs four or five pounds. Pearls of a delicate pink color are sometimes found in this shell. The *strombi* are sometimes called wing-shells, from the dilated margin of the lip.

STROMBOLI, one of the group of the Lipari islands (q. v.), the most north-easterly of the group, is about 12 m. in circumference, circular in shape, and contains 2,000 inhabitants. It is wholly of volcanic formation, and rises to the height of 3,038 ft. above sea-level. On its western side is a volcano of considerable activity. Sulphur and pumice-stone are gathered in large quantities, and among the chief agricultural products are cotton, wine, and excellent fruits.

STROM NESS. See ORKNEY ISLANDS.

STRONG, GEORGE C., 1832-63; b. Vt.; graduated at West Point, 1857, and held the position of 1st capt. of cadets there for 3 years. In 1861 he was attached to the staff of Gen. McDowell and acted as his aide at the battle of Bull Run. He afterward served with McClellan and Butler, and distinguished himself at Biloxi, Tangipahoa river, and in the assault on Fort Wagner, where he was fatally wounded. He rose to the rank of capt. of ordnance and brig.-gen. of vols. Gen. Strong was the author of *Cadet Life at West Point* (Boston, 1862).

STRONG, JAMES, S.T.D., b. New York, 1822; graduated at Wesleyan university, Middletown, Conn., 1844; settled at Flushing, L. I., and taught Hebrew and Greek to private pupils; received, though a layman, the degree of S.T.D. from Wesleyan university, 1856; professor of biblical literature and acting president of Troy university, 1858-61; professor of exegetical theology in Drew theological seminary, Madison, N. J., 1868; traveled in the east, 1874. In 1853 he became associated with the Rev. Dr. John McClintock in the preparation of the *Cyclopædia of Biblical, Theological, and Ecclesiastical Literature*, he having the department of biblical literature. After the death of Dr. McClintock he became the chief editor. He has published also *Harmony and Exposition of the Gospels*; *Greek Harmony of the Gospels*; *Manuals of Greek and Hebrew Grammar*; *Outlines of Theology*; *Appeal to Sunday-school Efforts*; also, articles in the *Methodist Quarterly Review* and *Christian Advocate and Journal*. He prepared the translation of the Book of Daniel for Lange's commentary, and was a member of the Anglo-American committee on the revision of the Bible. He died in 1894.

STRONG, JAMES H., b. Canandaigua, N. Y., 1814; son of Judge Elisha B.; entered the navy as midshipman, 1829; served in the Mexican war; commander, 1861; capt., 1865. He commanded the steamer *Mohawk*, 1861; the *Flag*, 1862; and the steam sloop *Monongahela*, 1863-65. In 1863 he transported a division of the secret expedition of Gen. Banks's army to Brazos, and aided the troops in taking the battery at Arkansas pass. He was in command of the *Monongahela* during her engagement with the ram *Tennessee* in the battle of Mobile Bay; commodore, 1870; rear admiral, 1873. D. 1882.

STRONG, NATHAN, D.D., 1748-1816; b. Conn.; graduated at Yale college, 1769; tutor there, 1772; ordained pastor of First Church (Congregational), Hartford, 1774, where he remained till his death; was a chaplain in the army in the revolutionary war. He published *The Doctrine of Eternal Misery Consistent with the Infinite Benevolence of God*; *Sermons*, 2 vols; *The Hartford Selection of Hymns*. He originated and edited the *Connecticut Magazine*, and was principal founder of the Connecticut missionary society. He held a high rank for learning and usefulness, and was noted for shrewdness and wit.

STRONG, THEODORE, LL.D., 1790-1869; b. Mass.; graduated at Yale in 1812, taking the mathematical prize; tutor in mathematics at Hamilton college, 1812-16; professor of mathematics at Hamilton, 1816-27. A new geometrical demonstration by him of the values of sines and co-sines of the sum and difference of two arcs, and a solution of a difficult problem in diophantine analysis, were published in the *American Journal of Science* in 1818. Other important papers appeared in subsequent numbers. After having mastered the *Principia* of Newton and the subjects added by its commentators, he addressed himself to the study of the more modern analysis of La Grange and Laplace. This required a knowledge of the French language which he did not possess, but he soon taught himself sufficient to be able to read mathematical works in French as well as in English or Latin. In 1827, upon a second invitation from Rutgers

college, N. J., he became professor of mathematics and natural philosophy in that institution, and removed to New Brunswick, where he remained during the rest of his life, performing the duties of his chair till 1862. Prof. Strong made many important contributions to mathematical science, among which may be mentioned the solution of what is known as the irreducible case of cubic equations of Cardan, a result which had long been sought in vain. He also devised a method for the application of the binomial theorem for the extraction of the roots of whole numbers. His two principal systematic works are: *A Treatise on Elementary and Higher Algebra* (1859); and *A Treatise on the Differential and Integral Calculus* (1869). Both of these treatises contain much original work. The work on Calculus, written in his 78th year, and without the aid of notes or books, has many original features, and is divested of technicalities and formulas which have become the accretions of time. It contains a solution, by a new and beautiful method, of the problem, "To find the area bounded by the ordinate of a plane curve drawn through the origin of the co-ordinates by any other ordinate and the intercepted parts of the axis and the curve, supposing the ordinates to be constantly positive between the preceding limits." Prof. Strong was a contributor to various mathematical and scientific journals for the greater part of his life. To the *American Journal of Science* he contributed 22 papers between 1818 and 1845. To the *Mathematical Diary*, published at New York and edited at first by Dr. Robert Adrian and afterward by James Ryan, he also contributed. To the *Mathematical Miscellany*, edited by Mr. Charles Gill at Flushing, L. I., he contributed 22 papers; to the *Cambridge Miscellany*, edited by Profs. Peirce and Lovering, seven papers; and to the *Mathematical Monthly*, edited by I. D. Runkle, two papers. He also communicated five different papers to the National academy of sciences from 1864 to 1867 inclusive. Among the papers contributed to the *American Journal of Science* are a systematic discussion of the laws regulating the action of a central force, the path of the curve produced thereby, and the mutual action of a system of bodies; a discussion of the parallelogram of forces, their composition and resolution, and the statical equilibrium. In volume xvi. of the journal, on p. 286, there is a deduction of the differential equation which constitutes the fundamental formula for expressing the angular velocity of a planet in terms of its radius vector, and thence, the force being given, the law of the curve of revolution, and of all curves produced by a central force, corresponding to the result given by Laplace in the first part of his second book of the *Mécanique Céleste*, and to that of Newton in the 41st proposition, section viii., of the *Principia*. He was one of the original members of the National Academy of Science, and was also a member of the Connecticut Academy of Arts and Sciences at New Haven, of the American Academy of Arts and Sciences at Boston, and of the American Philosophical Society at Philadelphia.

STRONG, WILLIAM, LL.D., b. Conn., 1808; graduated at Yale college, 1828. He studied law, and after his admission to the bar, 1832, began practice in Reading, Penn. In 1849 he was elected to congress and served two terms, after which he resumed practice. In 1855 he was elected a judge of the Penn. supreme court, but resigned in 1868. After two years of practice in the higher branches of the profession, he was appointed associate justice of the U. S. supreme court by Pres. Grant, retiring in 1880. He died at Lake Minnewaska, N. Y., Aug. 19, 1895.

STRONG, WILLIAM L., mayor of New York, born in Richland co., Ohio, March 22, 1827. At the age of sixteen he entered a dry-goods house in Wooster, Ohio, and in 1853 came to New York City, entering the employment of L. C. Wilson and Co. The following year he became connected with Farmham, Dale and Co., which after numerous changes in the firm dissolved partnership, in Dec., 1869, and was succeeded by W. L. Strong and Co. Mr. Strong was for many years a director of the Central National Bank and its president since 1887; a director of the Erie Railway Co., the N. Y. Life Insurance Co., the Mercantile Trust Co. and other corporations. He is a member of the Union League Club, president of the Ohio society and member of the Downtown, Merchants', Colonial, Republican and other clubs. On Nov. 6, 1894, he was elected mayor of New York on a fusion ticket, defeating the Tammany nominee by a large majority. His three years' term of office was marked by its strictly non-partisan character.

STRONGYLIDÆ, a family of nematode worms, possessing the following common characters: The body is round, and sometimes very much elongated, and almost thread-like. The mouth is round, oval, or triangular, and situated at the extreme anterior end of the body. The tail of the male is commonly furnished with a bursa, usually emitting two spicules. The whole family is parasitic, and contains a number of genera. Some of the strongylidæ are parasitic in man, some in mammals, birds, reptiles, etc.

STRONGYLUS (from the similar Greek word signifying *round*) is the term applied to a genus of the family *strongylidæ* (q.v.) of nematode parasitic worms. The only true strongylus infesting man is the *S. bronchialis* of Cobbold, previously known as *filaria hominis bronchialis*, *hamularia compressa*, etc. The male usually measures rather more than half an inch, while the female is upward of an inch in length. For the general and specific characters of this rare entozoon, the reader is referred to Cobbold's *Entozoa*, p. 357. The worm was originally discovered by Treutter in 1790, who found several

individuals in the bronchial glands of an emaciated subject. In 1845 it was again found by Dr. Fortsitz at Klausenberg in Transylvania, in the lungs of a boy six years old. These are the only two cases recorded by Küchenmeister and Cobbold of its occurring in the human subject; but closely-allied species, *S. paradoxus* and *S. micrurus*, are occasionally found, according to Cobbold, in the lungs and air-passages of the pig and the calf respectively, and Küchenmeister states that he has found a species in the lungs of the sheep.

Closely allied to strongylus is the genus *eustrongylus* of Diesing and Cobbold, which contains the species *E. gigas*, more commonly known as the *strongylus gigas* of Rudolphe, Cuvier, and others. This is the largest nematode worm at present known to infest man or any other animal; "the male measuring from ten inches to a foot in length, and $\frac{1}{4}$ of an inch in breadth; while the female is said to attain a length of over 3 feet, its transverse diameter being fully half an inch; body cylindrical, and more or less tinged with redness; head obtuse, and furnished with a simple oval aperture surrounded by six chitinous nodules: mode of reproduction, probably viviparous; eggs broadly oval, measuring about $\frac{1}{16}$ " from pole to pole."—*Op. cit.*, p. 358. This worm occurs, according to Bremser, in the kidneys and bladder, sometimes in the abdominal cavity and the omentum, more rarely in the lungs and liver of "martens, dogs, wolves, seals, otters, oxen, and horses." Fortunately it is very rare in man, and, according to Cobbold, weasels are the animals in which it is most commonly found. The symptoms to which it must give rise must be much the same as those arising from abscess and degeneration of one of the kidneys, or from renal calculi. The diagnosis in a suspected case could only be established by the detection of the eggs or embryos in the urine.

STRONSAY, one of the Orkney islands, lies 15 m. n.e. from the town of Kirkwall. It is $7\frac{1}{2}$ m. long, and 6 m. in extreme breadth. Pop., 1274.

STRONTIA. See STRONTIUM.

STRONTIUM (symb. Sr, equiv. 43.8—new system, 87.2—sp. gr. 2.54) is a ductile and malleable metal, somewhat harder than lead, and of a pale yellow color. When heated in the air, it burns with a crimson flame, and becomes converted into its oxide, strontia. It is unaffected by the action of dry air, but it decomposes water at an ordinary temperature, hydrogen being explosively developed; and it burns in chlorine gas, and in the vapor of iodine, bromine, and sulphur. It dissolves in dilute nitric acid, but the strong acid has scarcely any effect on it. This metal does not occur in the native state, but exists as a carbonate in the mineral *strontianite* (so called from its being first found near Strontian, in Argyshire), and as a sulphate in the mineral known as *celestine* (so called from its delicate blue tint). It is obtained by the voltaic decomposition of the chloride of strontium. This metal bears to barium the same close relation that sodium bears to potassium; and the compounds of strontium resemble those of barium not only in their composition but in their properties.

The oxide of strontium, commonly known as STRONTIA, is obtained in the same way, and resembles in almost all respects the corresponding oxide of barium, except that it is inert when taken into the system, while baryta is poisonous. When a small quantity of water is poured upon it, it slakes, giving out heat.

The salts of strontia resemble those of baryta in their general characters, and in their being precipitated from their solutions by sulphuric acid and the soluble sulphates; but they differ from them in not being thrown down by silico-fluoric acid or hyposulphite of soda, and in their communicating to the flame of the spirit-lamp and to burning substances generally, a brilliant purple-red color. The salts of strontia occur only in the mineral kingdom, and are never found as normal ingredients of organic bodies. *Carbonate of strontia*, SrCO_3 , occurs native both in a massive and crystalline form, and may be obtained artificially as a white powder by precipitating a soluble salt of strontium with carbonate of soda. *Sulphate of strontia* occurs native in *celestine*, a mineral which is found in beautiful rhombic prisms in Sicily. *Nitrate of strontia*, $\text{Sr(NO}_3)_2$, separates from a hot concentrated solution in large colorless transparent anhydrous octahedral crystals, which dissolve freely in water. By the addition of nitric acid, it is precipitated from its aqueous solution. This salt is insoluble in alcohol; but when finely powdered, and mixed with it, it communicates to the alcoholic flame a beautiful red or crimson color. In consequence of this property, it is employed by the makers of fireworks. A mixture of 40 parts of nitrate of strontia with 10 of chlorate of potash, 13 of sulphur, and 4 of sulphide of antimony, deflagrates with a magnificent red color, and constitutes what is popularly known as *red Bengal fire*; but the mixture is dangerous both to prepare and to preserve, having more than once been the occasion of frightful accidents to the manufacturers from its becoming ignited spontaneously.

The most important of the haloid salts of strontium is the *chloride*, SrCl_2 , which may be obtained in crystals containing six equivalents of water. The water is expelled at a moderate heat, leaving the chloride anhydrous. The chloride is the only salt from which the metal has hitherto been obtained.

Regarding the history of this metal, it may be observed that strontia was discovered as an independent substance almost simultaneously by Hope and Klaproth in 1793. In 1807 Davy obtained barium and strontium from their oxides, but not in a pure state:

and it was not till 1855 that Bunsen and Matthiessen succeeded in procuring perfectly pure specimens of the metal.

STROPHULUS. See RED GUM.

STROSSMAYER, JOSEPH GEORGE, b. Eszek, 1815. After being educated at Pesth, Vienna, and Padua, he became Roman Catholic bishop of the united sees of Bosnia and Sirmia in 1850. He attended the Vatican Council of 1869, and the text of a violent speech, opposed to the introduction of the question of papal infallibility, was published in several journals as having been made by Bishop Strossmayer. In 1872, however, he wrote a letter to the *Français*, in which he denied having made such a speech. He retired from his see in 1891.

STROTH'ER, DAVID HUNTER, b. Va., 1816; came to New York in 1845 and studied art for several years. In 1853 he first became known to the public as "Porte Crayon," the author of a series of very amusing papers illustrative of travel, scenery, and manners in the south and elsewhere, some of which were afterward collected in *Virginia Illustrated* (1857). He entered the union army as capt. in 1861, became colonel, resigned in 1864, and in 1865 was brevetted brig.-gen. After the war he published in *Harper's Monthly* (where all his writings had appeared) a series of *Personal Reminiscences of the War*. He was consul-general to Mexico, 1879-85. He d. 1888.

STROUD, a market t. of Gloucestershire, 9 m. s.e. of the city of Gloucester, stands in a beautiful and extensive valley, at the confluence of the Frome and Slade, which unite to form the Stroudwater or Frome. It is the center of the woolen manufactures of Gloucestershire, and contains a number of woolen and silk-mills. The water of the Frome is peculiarly adapted for use in dyeing scarlet and other grain colors; and on this account cloth-factories and dyeworks have been built along its banks for the distance of 20 miles. Pop. '91, 9818.

STROUSBERG, BETHEL HENRY (DR.), b. Prussia, 1823; of Jewish parentage; original name Baruch Hirsch Strausbergi; in early life converted to Christianity; entered the office of his uncles, commission merchants, in London, 1835; married an English-woman; failed in the insurance business in 1847; became a teacher of languages in New Orleans, 1848; speculated in damaged goods to such advantage that he was able to return to London in 1849, and assist in publishing *The Chess Player* and other magazines. In 1855 he went to Berlin on insurance business, and negotiated for the East Prussian railway. He became a railroad magnate, building railroads in Germany, Hungary, and Roumania, and owning immense factories for manufacturing railroad materials. He established beet-sugar and porcelain factories, and was the proprietor of the Berlin cattle yard, the citadel grounds at Antwerp, and an immense estate in Bohemia. He engaged in vast speculations, employed 100,000 persons at one time, and was pointed out in Berlin as *Der Wunderdoctor*. In the war of 1870-71 he met with enormous losses; failed in 1875 in consequence of some transactions with the Roumanian government, and was imprisoned at Moscow for certain irregularities connected with a bank. He d. 1884.

STRUCK JURY. See SPECIAL JURY.

STRUENSEE, JOHANN FRIEDRICH, Count of, a man who, in the 18th century, attracted the attention and excited the sympathy of the whole of Europe, by his elevation and downfall at the Danish court. Struensee was born Aug. 5, 1737, at Halle on the Saale, where his father, Adam Struensee, the author of the old Halle Hymn-book, was pastor of the Ulrichskirche. Young Struensee studied medicine, and when scarcely 19 years old passed as doctor. Early alienated from positive Christianity, he zealously embraced the philosophy which had then arisen in France, and became a disciple of Helvetius and Voltaire. When his father removed to Altona he accompanied him, and was soon afterward appointed traveling physician to the young king, Christian VII. of Denmark; and on their return from a tour, physician in ordinary. At first the young queen, Caroline Matilda, sister of George III. of England, looked upon him with mistrust; and it was not till 1770, when Struensee successfully managed the inoculation of the two-year old crown-prince, afterward king Frederick VI., that she came round to him, intrusted him with the education of the prince, and by degrees made him the confidant of her unhappy position. Struensee removed the estrangement between the royal pair, which was the work of the favorite Holck, and, in consequence, rose still higher in favor with both. He was appointed reader to the king, and private secretary to the queen. Since the revolution of 1660, Denmark had been under the domination of the nobility, who, as a council of state, governed the country. Struensee saw the disadvantages of this government of the nobles, and formed the ambitious resolve to come forward in this land of his adoption as an enlightened reformer after the model of Frederick II. To begin with, he effected the downfall of the favorite Holck, in whose stead his friend Brandt was appointed royal companion and director of the court amusements. In order to gain the love of the people, Struensee proclaimed the freedom of the press. The council was dissolved, and a proclamation issued to the effect that the royal power in all its purity, as it had been handed down from olden times, was to be re-established. These measures amounted in reality to a revolution, and to a declaration of war against the aristocracy. The queen and Struensee, in whose hands the whole power now was, chose new ministers, and excluded

the feeble Christian entirely from the management of affairs. In July, 1771, Struensee received the title of cabinet minister, along with unlimited power. He brought several men from Germany, whom he appointed to different offices. This introduction of strangers caused great dissatisfaction among the people. In opposition to the politics of his predecessors, Struensee endeavored to free Denmark from Russian influence, and to find a natural ally in Sweden. The changes which he undertook in the internal affairs were directed to the advancement of the prosperity of the country, of civil liberty, and enlightenment. He put the finances in order, reduced the expenditure, loosened the fetters in which industry and trade had been bound, encouraged education, mitigated the penal laws, and brought order into the administration. An act passed in 1771 to a certain extent abolished serfage. All these reforms, which are still in operation in the Danish dominions, were excellent; but the haste and want of statesmanlike skill with which they were carried out made them appear as the acts of the most vexatious tyranny. Struensee committed a great mistake, too, in recklessly obtruding his philosophy of enlightenment in the face of the strict orthodox clergy and the pious prejudices of the people.

Struensee had scarcely been in power a year when the symptoms of reaction appeared in all quarters. The queen gave birth to a daughter in 1771, which, in the condition of the king, gave rise to most scandalous reports. The British ambassador, lord Keith, who saw the catastrophe approaching, proposed to Struensee, by advice of George III., to take refuge in England; but Struensee declined doing so. At the head of the hostile party was Christian VII.'s step-mother, Juliana Maria, princess of Braunschweig-Wolfenbüttel, who was impatient of the domination of the queen and Struensee. A bold stroke was to precipitate Struensee and ruin the queen, and the night when a court ball was to take place was fixed upon for carrying out the plot. The conspirators assembled at the king's stepmother's, and by a secret door entered the bedroom of the king, and obliged him to make out 15 warrants of arrest, among others for Struensee. Christian was prevailed upon, but with much difficulty, to write out orders to arrest and convey his consort the queen to Kronenburg. Struensee and the queen were then taken prisoners, and the former was treated with extreme harshness, put in chains, and brought to the citadel. He was accused of an assault on the person of the king; of the intention to compel Christian to abdicate the throne; of criminal intercourse with the queen; of using a fatal system in the education of the crown-prince; and of the usurpation and abuse of supreme power. Not one of these points could be legally proved. Struensee was, however, found guilty of a great and capital crime, and was sentenced to a cruel death. It was wished by some to proceed further against the queen; but the commissioners were satisfied with the simple separation of the royal pair, especially as the British ambassador threatened the appearance of a British fleet. After the king had confirmed the sentence, not without being urged by the Russian ambassador, it was carried into execution, April 28, 1772, amid the rejoicings of the multitude. In the prospect of death, Struensee is said to have returned to the Christian faith. There is no doubt that he did not deserve his fate, but that he fell a sacrifice to the party of the nobles. The execution of his friend Brandt, which took place at the same time, was a still clearer case of legal murder, as he never took any part in the affairs of government. Struensee's brother would have shared his fate had not Frederick II. claimed him as a Prussian subject. Queen Caroline Matilda left Denmark in May, 1772, and died of grief in 1775, in the castle of Celle in Hanover.

In recent times Struensee's history has been recalled to memory in a tragedy by Mich. Beer and Heinr. Laube. See Höst, *Count Struensee and his Ministry* (1824; Germ. Copenh. 1826); Falkenköld, *Mémoires* (Paris, 1826).

STRUTT, JOHN WILLIAM, third Baron Rayleigh, a distinguished physicist, born in England, Nov. 12, 1842. He was educated at Trinity college, Cambridge, graduated in 1865, as senior wrangler in the mathematical tripos, and became a fellow of the college in 1866. He succeeded to the title in 1873. He was professor of experimental physics in the university of Cambridge, during 1879-84, and professor of natural philosophy in the Royal Institute of London since 1887. He has been a fellow of the Royal Society since 1873, president of the British Association (section A) since 1882, member of numerous other scientific societies, and a correspondent of the Institute of France. In 1894, he discovered, in conjunction with Prof. Ramsay, a new element, present in the atmosphere, which he has since prepared in quantity and has named *Argon*. For this discovery he received from Columbia college, on recommendation of the National academy of sciences, the Barnard medal "for meritorious service to science." He is the author of many valuable papers on "Optics," (in *Philosophical Magazine*, 1871-72), on "Resonance" (*Philosophical Transactions*, 1871); *The Theory of Sound*, (2 vols., 1877-78), and many other papers in scientific journals.

STRUTT, JOSEPH, 1742-1802; b. England; studied painting, but afterward devoted himself to antiquarian researches. Among his works are *The Regal and Ecclesiastical Antiquities of England* (1773); *The Chronicle of England* (1777-78); *Complete View of the Dress and Habits of the People of England from the Establishment of the Saxons in Britain to the Present Time* (1796-99); and *The Sports and Pastimes of the People of England* (1830).

STRUVE, FRIEDRICH-GEORG-WILHELM, a celebrated astronomer, was b. at Altona, April 15, 1793, educated at the university of Dorpat (Russia), and appointed to a post in the observatory of that place in 1813. He became director of the Dorpat

Observatory in 1817, and continued with the utmost assiduity his observations and researches respecting double and multiple stars, adding immensely to our knowledge of these systems; and earning for himself the reputation of being one of the most skillful of practical astronomers. The instrument with which he observed was a Fraunhofer's (q.v.) refractor, of 10 in. aperture, and $13\frac{1}{2}$ ft. focal length; and with this telescope, in gleaning from the depths of space the materials for his three important works on double stars (1822 and 1828, 1837 and 1840, 1852), he examined no fewer than 120,000 of these twinkling luminaries. His investigations have led him to the conclusion, that the number of true double stars is much larger than was previously supposed (see STARS). Struve also executed a number of important geodetic operations, such as the triangulation of Livonia, in 1816-19, and the measurement of an arc of the meridian in the Baltic Provinces, in 1822-27; which was subsequently (1828-56) extended by him in conjunction with Hansteen (q.v.) and Selander, to the North Cape; and by Gen. Tenner southward to Ismail in Turkey. This latter undertaking, the most extensive trigonometrical operation ever performed, when completed, gave the length of a meridian arc of 20° , and enabled geometers to determine with increased accuracy the exact form of the earth. Meanwhile, Struve had been appointed, in 1839, director of the best organized observatory in the world, that of Pulkova (q.v.), and also chosen *correspondant* in the astronomical section of the Academy of Sciences of Paris. He died at St. Petersburg Nov. 23, 1864.—His son, OTTO WILHELM STRUVE, also an eminent astronomer, was born at Dorpat, May 7, 1819, was educated under his father's direction, became his chief assistant at Pulkova, and the director of the observatory after his death. He has made numerous astronomical discoveries, among which are more than 500 new double stars, and (1847) a satellite of Uranus, and has written numerous important papers, the most noticeable of which set forth his researches on the inner or dusky ring, and on the variation in breadth of the bright rings of Saturn, and on the periodic motions of double stars. He published 14 volumes of *Observations de Poulkova* (1869-93).

STRYCHNIA, or STRYCHNINE. See NUX VOMICA.

STRYCHNOS, a genus of trees of the natural order *loganiaceæ*, having a five-lobed calyx, a tubular funnel-shaped or salver-shaped corolla, with a five-partite limb, five stamens, a filiform style, numerous ovules, and a one-celled berry, with a leathery rind, many-seeded, or, by abortion, one-seeded, the seeds discoidal and compressed. To this genus belongs the *S. nux vomica*, a tree of middling size, with ovate-stalked leaves, a native of India, the fruit of which is produced in great abundance, and is about the size of a small orange; the seeds are the *nux vomica* of commerce, and yield *strychnine*. The bark partakes of the poisonous quality of the seeds. The wood of the tree is very hard and durable. The clearing-nut (q.v.), and St. Ignatius' (q.v.) bean are produced by species of this genus, to which also belongs the tree (*S. toxifera*) which produces the woorial or curare (q.v.) poison of South America. Another species is the UPAS TIEUTÉ (*S. Tieute*) of Java, a large climbing shrub, the bark of which is extremely poisonous, containing a very large quantity of strychnine. The wood of a species found in the north of India (*S. colubrina*), which is also a climber, is an imaginary cure for snake-bites. The bark of *S. pseudo-quina*, a Brazilian species, is used as a substitute for cinchona.

STRYPE, Rev. JOHN, a voluminous ecclesiastical historian, was b. in London in 1643. He studied at Cambridge, entered the church, and held for many years, with other smaller livings, the rectory of Low Leyton, in Essex. He died at Hackney in 1737, having reached the great age of 94. His works fill thirteen large folio volumes. The most important are—*Memorials of Archbishop Cranmer* (1694); *Life of Sir Thomas Smith, secretary of state to Edward VI. and Elizabeth* (1698); *Lives of Bishop Aylmer* (1701), *Sir John Cheke* (1705), *Archbishop Grindal* (1710), *Archbishop Parker* (1711), and *Archbishop Whitgift* (1718); *Annals of the Reformation* (vol. i. 1709, vol. ii. 1723, vol. iii. 1728, and vol. iv. 1731); *Ecclesiastical Memorials*, relating to religion and the church of England under Henry VIII., Edward VI., and queen Mary, in 3 vols. folio, published in 1721. This is his best work, forming, with Burnet's more readable *History of the Reformation*, a consecutive and full account of the reformed Anglican church. Strype also published an enlarged edition of Stow's *Survey of London*, with several sermons and pamphlets. As a writer, he is heavy, but honest and plodding, and he was a faithful transcriber of the ancient papers he published, which, he says, were all copied with his own hand.

STUART, Lady ARABELLA, or ARBELLA, 1575-1615, b. England; daughter of Charles Stuart, earl of Lennox, and cousin of James I. Her relationship to Elizabeth gave rise to a number of plots to put her on the throne. Several schemes to marry her were defeated by Elizabeth. In 1603 sir Walter Raleigh was charged with a plot to place her on the throne. In 1610 it was discovered that she had made a secret marriage with William Seymour, grandson of the earl of Hertford. Seymour was imprisoned in the Tower, and she was put in the custody of the bishop of Durham, but escaped to a French vessel, in which her husband, who had escaped from the Tower, was also to sail. He did not reach it, and it sailed and was captured. He escaped, however, in another vessel. Arabella spent the rest of her life in the Tower, and finally became insane.

STUART, CHARLES EDWARD LEWIS CASIMIR, often called the younger pretender, the eldest son of James Francis Edward, prince of Wales, known as the elder pretender, or chevalier St. George (see **STEWART, FAMILY OF**), and his wife Clementina Sobieski granddaughter of the celebrated Polish monarch, John Sobieski. He was born at Rome on Dec. 31, 1720, and bore among the Jacobites the title of Prince of Wales. He served under Don Carlos in Spain, and in his youth is described as having been handsome, affable, and engaging in manners. In 1743, 28 years after his father's unsuccessful attempt to regain the crown, a scheme was contrived in France, with the support of the Jacobites in England, by which Charles Edward was to recover the throne of Great Britain for his family. The first contrived project was to land an army in Kent, where were many adherents of the exiled house; and troops to the number of 15,000 were assembled, and transports provided at Boulogne, Dunkirk, and Calais to carry them to England. But the squadron which was to have convoyed the transports fled before the British fleet under sir John Norris; a storm destroyed the transports, and most of the troops were drowned. Charles, however, only awaited a favorable opportunity to make a fresh attempt. In July, 1745, when George II. was in Hanover, and Scotland almost without military, he sailed from Nantes, in company with the marquis of Tullibardine, and a few other devoted followers, and landed in the bay of Lochnanuagh, whence he proceeded to Kinlochmoidart, where the Highland clans attached to his cause were summoned to rise. Ten days later, Charles's standard was set up at Glenfinnan; and he marched southward at the head of a large body of hardy mountaineers. Government offered a reward of £30,000 for the apprehension of the pretender's son, who retaliated by offering a like reward for the apprehension of the elector of Hanover. At Perth, the insurgents were joined by the duke of Perth and lord Strathallan, with a numerous retinue of followers; and on their approach, Edinburgh surrendered without resistance, the castle, which was in possession of the king's troops, still holding out. Charles took up his residence at Holyrood Palace, where he proclaimed his father king of Great Britain, and himself regent.

Meanwhile, sir John Cope, the commander-in-chief of the king's troops in Scotland, having collected some re-enforcements in the n., came from Aberdeen to Dunbar by sea, and encamped at Prestonpans. He was there unexpectedly attacked by the Highlanders, and ignominiously routed, leaving baggage, cannon, and camp equipage on the field. Contrary to the advice of his council, Charles, who could not bear opposition, resolved to advance into England, though his force hardly exceeded 6,500 men. Carlisle surrendered at his approach, and he proceeded unmolested as far as Derby. In the mean time, three English armies, each larger than his own, were preparing to meet him. Being unable to raise any recruits in England, he found it necessary to retreat into Scotland, where he hoped to meet a re-enforcement under lord John Drummond. On their way n., the Highlanders were pursued by the duke of Cumberland, whom they defeated near Penrith. Finding that Edinburgh was now in possession of the king's troops, Charles, joined by lord John Drummond and lord Strathallan, made his way to Stirling. That town surrendered to him, and he laid siege to the castle. Gen. Hawley, in endeavoring to raise the siege, was utterly routed by lord George Murray, at the head of the Macdonalds of Keppoch. But the advance of the duke of Cumberland obliged the rebels to retreat further n., and for a time they carried on a desultory war with the king's troops in the neighborhood of Inverness. On April 16, 1746, the duke of Cumberland encountered Charles's army on Culloden Moor, and opened a heavy cannonade on them. The Highlanders at first rushed boldly forward; but on the advance of the royal infantry, they gave way; the battle soon became a rout, and the fugitives were pursued and slaughtered by the dragoons, who gave no quarter, and spread carnage and desolation over the country. The rebels lost that day at least 1000 men of the bravest and most devoted to the cause. Charles escaped to the Hebrides, hunted by the king's troops; disguised in female attire, he was conveyed to Skye in an open boat by Flora Macdonald, daughter of Macdonald of Milton. For months he wandered in concealment among the mountains of Skye and the mainland, where he had many hairbreadth escapes; and though his secret was known to hundreds of the poorest of the people, no one was tempted by the £30,000 reward to betray him. He eventually escaped to France, and no further attempts were made to reinstate the exiled family.

Charles Edward remained in France till the peace of Aix-la-Chapelle (1748). It was made a condition of that treaty that France should abandon the cause of the Stuarts; and Charles, refusing to quit France voluntarily, was conducted with a guard out of the kingdom, and retired to Rome.

He married on April 17, 1772, Louisa Maximiliana de Stolberg-Guedern, daughter of Gustavus Adolphus, prince of Stolberg-Guedern. The union did not prove a happy one, and the princess withdrew herself from him. See **ALBANY, COUNTESS OF**. In the latter years of his life, the prince was addicted to intoxication. When his claims ceased to be supported by any foreign power, he dropped the title of prince of Wales, and assumed that of count of Albany. He died at Rome, Jan. 31, 1788, and was buried at Frascati. There was no issue of his marriage, but he left a natural daughter, on whom he bestowed the title of duchess of Albany, and to whom he bequeathed considerable property.

Two brothers, generally known as John Sobieski Stuart and Charles Edward Stuart

endeavored, some years ago, to persuade the world that they were legitimate grandsons of Charles Edward. In point of fact, they were sons of Captain Thomas Allen, R.N., and grandsons of Admiral John Carter Allen, who died in 1800. Their story, as set forth, with some slight mystifications, in a work called *Tales of the Century, or Sketches of the Romance of History between the Years 1746 and 1846*, was to the effect that their father, in place of being Admiral Allen's son, was a son of prince Charles and the princess Louisa, whose birth was kept secret, from fear of the Hanoverian family, and who was intrusted to Admiral Allen, and passed off by him for his own son. The life of Charles Stuart is detailed in *History of the Rebellion, 1745-46*, by R. Chambers.

STUART, GILBERT CHARLES, American painter, was b. at Narragansett, Rhode Island, in 1755. In his boyhood, he went to Edinburgh with a Scotch painter named Alexander, with whom he studied his art; but his master dying, he worked his passage home, and began to paint portraits at Newport. In 1778 he made his way to London, where he led for two years a wild Bohemian life; but his talent was recognized by his countryman, Benjamin West, president of the Royal Academy, who took him into his family, and whose full-length portrait he painted for the National Gallery. In 1781 he opened his studio in London, and painted the portraits of his majesty George III., H.R.H. the prince of Wales, the duke of Northumberland, sir Joshua Reynolds, John Kemble, col. Barré, and many other celebrated characters. He also made a professional visit to Dublin, and in Paris painted a portrait of Louis XVI. In 1793 in the fullness of his powers and fame, he returned to America, and painted portraits of Washington, Jefferson, and many of the distinguished men of the period, and commenced a portrait of John Quincy Adams, which at his death was finished by Sully. He died at Boston, July, 1828.

STUART, JAMES EWELL BROWN, 1833-64; b. Va.; graduated at the U. S. academy, West Point, 1854. He was engaged on the frontier fighting Indians, under Sumner and Joseph E. Johnston, and became noted for his daring. In 1857 he was severely wounded while fighting a party of Cheyennes. In May, 1861, President Lincoln appointed him a capt. in the U. S. cavalry, but he declined the appointment to accept from the confederates that of col. of a Virginia cavalry regiment. He commanded the confederate cavalry at the first battle of Bull Run; and in September was appointed brig.gen., and given command of all the Virginia cavalry. He made several successful raids on the union positions, and was appointed maj.gen. in the confederate army, and placed in command of a division of cavalry. On Aug. 22, 1862, he made his famous dash at the right flank of Gen. Pope's army, at Catlett's station. During a heavy storm he penetrated to Pope's headquarters, where he succeeded in capturing important papers, besides obtaining the private effects and dress uniform of Gen. Pope, and of several of his officers. He made important raids after Antietam; in the Chancellorsville campaign; and during Lee's invasion of Pennsylvania; and covered the confederate retreat after the battle of Gettysburg. He was defeated by Sheridan's cavalry in the Wilderness; and on May 12, 1864, was mortally wounded in an engagement with them near Richmond; to which city he was taken, and where he died on the evening of the same day.

STUART, MOSES, American divine and author, was born at Wilton, Conn., Mar. 26, 1780, and educated at Yale, where he remained for some time as a tutor. He began the study of law, but abandoned it for theology; was ordained as pastor of a Congregational church at New Haven in 1806; and in 1809 was appointed professor of sacred literature at the theological school at Andover, a position he filled till 1848. During this period, in addition to his professorial duties, he wrote a *Grammar of the Hebrew Language*, without points; *Letters to the Rev. W. E. Channing*; *Hebrew Grammar*, with points (based on Gesenius); *Commentaries on the Epistle to the Hebrews*, and *the Epistle to the Romans*; on the books of *Ecclesiastes*, *Proverbs*, *Daniel*, and *the Apocalypse*; *Hebrew Chrestomathy*; *Essay on the Liquor Traffic*; *Essay on Christian Baptism*; *Hints on the Prophecies*; *Conscience and the Constitution*—manifesting in all acuteness, vigor, and versatility. Moses Stuart has been called the father of biblical science in this country. While his own contributions to it are of great value, he accomplished still more by the impulse which he gave to others. Studying the Hebrew language with enthusiasm, he infused the same spirit into his classes. He died at Andover, Mass., Jan. 4, 1852. His daughter Elizabeth married Rev. Austin Phelps, D.D., and was an author of considerable popularity. His grand-daughter, Elizabeth Stuart Phelps Ward, is widely known as an author.

STUBBS, THE RIGHT REV. WILLIAM, D.D., was born at Knaresborough, June 21, 1825; educated at the Grammar School, Ripon, and at Christ Church, Oxford, and elected to a Fellowship at Trinity College in 1848. He was ordained in 1848, was Diocesan Inspector of Schools in the diocese of Rochester till 1866, when he was appointed Regius Professor of Modern History at Oxford. In 1868 he was elected Curator of the Bodleian Library, and in 1872 was chosen a member of the Hebdomadal Council. In 1875 he was presented to the Rectory of Cholderton, Wilts, appointed Canon Residentiary of St. Paul's, 1879; consecrated Bishop of Chester in 1884, and Bishop of Oxford in 1889. He has published *Mosheim's Institutes of Church History* (1863); *Chronicles and Memorials of Richard I.* (1864-65); *Chronicle of Roger Hovedon* (1868-71); *Memorial of Walter of Coventry* (1872-73); *Memorials of St. Dunstan* (1874); *Select Charters and other Illustrations of English Constitutional History, from the Earliest Period to the Reign of Edward I.* (1870); and his most famous work, *The Constitutional History of England*, in three volumes (1874, 1875 and 1878).

STUCCO, a composition used for the finer parts of plaster-work, such as cornices, enrichments, etc. Gypsum (q. v.), or plaster of Paris, is used for this purpose. A coarser kind of stucco is also used for making floors, and for plastering the exterior of buildings. See *illus.*, SPAIN, Vol. XIII.

STUHLWEISSENBERG (Hung. *Székes Fejérvár*, Slav. *Bielhrad* or *Bialigrad*, Lat. *Alba Regalis* or *Alba Regia*), a royal free town of Hungary, and seat of a bishop, lies in a swampy plain in the neighborhood of the marshes of Sár-Rét, 16 m. n.e. of lake Balaton. The principal buildings are the splendid cathedral of the Virgin Mary, the church of St. John, and the bishop's palace. It has several Catholic schools, a military academy, and a theater; the principal square is adorned by a bronze statue of the Hungarian poet Vörösmarty. The inhabitants manufacture cotton cloths, flannels, leather, silk, and knives ("Stuhlweissenburg clasp-knives"), and extract soda from the swamps. Pop. '90, 27,548. Stuhlweissenburg is built on the site of the Roman *Floriana*, and from 1027 to 1527 was the place where the kings of Hungary were crowned and buried, 14 of whom repose here. In later times it suffered much from the ravages of war, and was for some years in the hands of the Turks.

STUMPF, KARL, psychologist, b. at Wiesentheid, Bavaria, April 21, 1848; studied at the universities of Würzburg and Göttingen, and was professor of philosophy successively at Würzburg (1873), Prague (1879), Munich (1889), and Berlin (1894). He is a member of the Prussian academy of sciences, and is the author of *Ueber das Verhältnis des Platonischen Gottes zur Idee des Guten* (1869); *Ueber den psychologischen Ursprung der Raumvorstellung* (1873), *Tompsychologie* (1885-90) and *Psychologie und Erkenntnistheorie* (1891).

STUNDISTS, Protestant sect, mostly of Russians from the Eastern church, formed in 1817 by colonists of Württemberg, and now numbering over a million adherents. Its formulas closely resemble those of the Anabaptists; it repudiates the sacraments, and demands an equal distribution of property.

STURDY, or the *Gid*, affects sheep, and occasionally cattle, and is caused by the presence within the brain of a hydatid, reaching sometimes the size of a hazel-nut, and floating in a watery fluid inclosed in a membranous sac. This hydatid, when given to dogs, is known to produce tape-worms, and conversely itself originates from the ova of the tape-worm ejected on the pastures by dogs, rabbits, or even by sheep themselves. In the state of ova, or in some of its earlier minuter transitional forms, the hydatid embryo is picked up along with the grass, passes into the blood, and is thence laid down in the soft loose textures of the brain. It is most common in low damp pastures, and amongst sheep from six to twenty months old. The animal cannot properly seek its food, loses condition, staggers when moved, turns stupidly round almost in one spot, and usually toward the side on which the hydatid lies. The parasite and its sac may generally be safely removed by placing the sheep, with its feet tied, on a table or bench, searching for the softened portion of the skull, which generally overlies the hydatid, laying back a flap of skin, and introducing the trochar and canula, and when the sac is deep-seated, cautiously withdrawing it with the help of a small syringe. Protected by a leather cap and simple water-dressings, the wound speedily heals.

STURGEON, *Accipenser*, a Linnæan genus of cartilaginous fishes, now forming the family *sturioidæ*, and placed by Müller in the order of *ganoids*, distinguished by the ganoid (q. v.) scales or bony shields which form the external covering. The gills are free, as in the osseous fishes. The vertebral column is soft; and there are no evident sutures in the skull. Reproduction is by roe, as in osseous fishes. The form of sturgeons is elongated and angular; the plates are arranged in regular rows; the head is cuirassed; the snout long and conical; the mouth is on the under surface of the head, tubular, protractile, and without teeth. The upper lobe of the tail is much larger than the under. The dorsal and anal fins are opposite to one another, behind the ventrals. The air-bladder is very large, and communicates with the gullet by a large hole. The species of sturgeon are numerous, and inhabit both the sea and fresh water, ascending deep muddy rivers at certain seasons, and temporarily inhabiting lakes. Numerous species are found in the northern parts of the world, although there are none in the Arctic ocean, or the rivers which flow into it, but the s. of Siberia and North America particularly abound in them. They are plentiful in the Caspian and Black seas, and in the rivers connected with them, where the sturgeon fishery is of great importance, supplying the inhabitants of large districts with their chief article of subsistence, and producing great quantities of caviare (q. v.), or preserved sturgeon roe, and of isinglass (see *GELATINE*), for sale. The COMMON STURGEON (*A. sturio*) is sometimes caught in the mouths of British rivers, most frequently in salmon-nets; and is a large fish, 6 or 8 ft. in length, with five rows of flattened plates; the muzzle long and pointed. Another species (*A. latirostris*), with broader muzzle, also visits the British coasts, but they are not popularly distinguished. The sturgeon is more abundant on the northern coast of Europe. It is also found in the more southern parts, and was in very high repute for the table among the Greeks and Romans. At their banquets it was introduced with particular ceremonies. In England, when caught in the Thames, within the jurisdiction of the lord mayor of London, it is a *royal* fish, reserved for the sovereign. Its flesh is white, delicate, and firm. It is used both fresh, generally stewed, and pickled or salted.—The

largest species of sturgeon is the **BIELAGA**, or *Иuso* (*A. Iuso*) of the Black and Caspian seas, and their rivers. It attains the length of 20 or 25 ft., and has been known to weigh nearly 3,000 lbs. It enters the rivers in winter, while they are still covered with ice. Great part of the caviare of commerce is made from it, and much isinglass, which is merely the air-bladder washed, cut into strips and dried. The **STERLET** (*A. Ruthenus*) is a comparatively small species, only about 3 ft. in length, found in the same regions, and particularly esteemed for the delicacy of its flesh, and of the caviare obtained from it. There are several other European and Asiatic species; and some of the North American rivers and lakes abound at certain seasons in species of sturgeon which are peculiar to them.—Sturgeons spawn in fresh water, but the young are seldom seen there, and are supposed to descend very early to the sea.

STURGIS, SAMUEL DAVIS, b. Penn., 1822; graduate of West Point, 1846; served through the Mexican war; taken prisoner during the operations before Buena Vista; exchanged after a short confinement. He was on duty in California, New Mexico, and the w. frontier; capt., 1855. In the war of the secession he was obliged to abandon fort Smith, Arkansas (his officers having resigned to join the confederate army), taking with him his command and saving the government property. As maj. 4th cavalry, 1861, he served under Lyon, and succeeded to his command at Wilson's Creek. In 1862 he was assigned to the command of the fortifications at Washington. He was prominent at South mountain, Antietam, Fredericksburg, and in the operations in Kentucky and Ohio, 1863-64, joining in the expedition against Gen. Forrest; col. 7th cavalry, 1869. He had been brevetted maj.-gen., 1865. In 1886 he retired from active service.

STURT, Sir CHARLES, 1806-69; b. England; entered the British army, and in 1825 was stationed in New South Wales, then holding the rank of capt. In 1828 he headed an exploring expedition which penetrated the interior of Australia and discovered the Macquarie, Castlereagh, and Darling rivers, and in 1830, the Murray river, which he descended to Lake Alexandrina. Another expedition in 1844 reached the desert in the center of the continent. For these explorations he was honored with high colonial positions and on his return to England was knighted. He published two books describing his explorations.

STURTEVANT, JULIAN MONSON, b. Conn., 1805; became professor of mathematics in Illinois college, and in 1844 was elected its president, resigning the position about 1880. He published about 1862 *The Present Attitude of England toward the United States*, and also wrote *Economics; The Keys of Sect*, and contributed to many religious periodicals. He was original and vigorous as a thinker. He d. 1886.

STUTSMAN, a co. in N. Dakota, drained by the Dakota river and Pipe-stem creek; 2304 sq. m.; pop. '90, 5266, chiefly of American birth, with colored. It is intersected by the Northern Pacific railroad. It contains the Fort Seward military reservation. The surface in the vicinity of its co. seat is much diversified, in other portions stretching into level fertile prairies for miles on either side of the railroad track. Co. seat, Jamestown.

STUTTERING. This loose and imperfect action of the organs of articulation is often inaccurately confounded with *stammering* though physiologically distinct from it. The distinction will be found explained and elaborated in the article **STAMMERING AND DEFECTIVE SPEECH** (q.v.).

STUTTGART, the royal residence and metropolis of Württemberg, is beautifully situated in a widening of the Nesenbach valley, the hills forming a semicircle of eminences clothed with vineyards, orchards, and gardens. The basin in which Stuttgart nestles is 897 ft. above the sea-level, and enjoys a mild and healthy climate.

In the Altstadt, which occupies the center of the town, the streets are narrow and gloomy, but the new quarters, mostly erected during the present century, have fine, broad streets, symmetrical squares, and handsome buildings. The schloss, or palace, is a fine modern building. The royal park and gardens extend from the n.e. side of the palace for 2 m. in the direction of Canstatt, have an area of 560 acres, are adorned by fine groups of trees, and intersected by shady avenues, in which all classes may freely walk. The cathedral, built in the 15th c., was gifted by the king, in 1852, with several beautiful painted windows. Other principal buildings are the royal theater, public library, mint, museum of art, polytechnic school erected in 1860-65, the royal stables for 300 horses, etc. A fine statue of Schiller has been erected in the palace place. The extensive royal library is especially rich in MSS., Bibles in various languages, and specimens of early printing.

Stuttgart has many benevolent institutions and societies. There is direct railway communication with the leading cities of Germany, Switzerland, France, Belgium, and the Netherlands. Pop. '95 (including garrison), 158,321. Since 1866, and especially since the Franco-Prussian war, trade has increased in a remarkable degree. The principal industries are the manufacture of machinery, musical instruments, cotton and wool fabrics, carpets, leather, paper, glass, porcelain, gold and silver articles, jewelry, perfumery, chemicals, tobacco, beer-brewing, etc. Stuttgart has a high position in the book-trade, and is the place of meeting of the booksellers' union of southern Germany. Stuttgart was the birth-place of Hegel; here, also, Schiller's youth was spent. The

name of the city occurs for the first time in 1229. It was besieged by King Rudolph of Hapsburg, 1286-87, and appears then to have been a place of strength. Between 1634-38, nearly 9,000 people died of the plague; and during the wars of Louis XIV., Stuttgart was thrice taken; and again in 1796, 1800, and 1801.

STUYVESANT, PETER, 1602-82, b Holland; in early manhood entered the military service of the Dutch in the West Indies, and in 1634 was made director of the colony of Curaçao. In 1646 the Dutch West India company appointed him director-general of their American colonies. He soon gained the confidence of the colonists, and reconciled the Indian tribes who had been made hostile by former unjust treatment. He also succeeded in arranging with the English commissioners, in 1650, the boundaries between their respective territories. A convention of delegated colonists in 1653 demanded for the people, among other things, a confirming voice in the appointment of local officers. Stuyvesant, with characteristic boldness, ordered them to disperse forthwith, claiming that his authority was not from the people, but from God and the Dutch West India company. The people submitted, but with mingled feelings of chagrin and discontent. The protracted contentions of the Dutch and the Swedes, dwelling near the Delaware river, about governmental jurisdiction, became more critical in 1654 when the Swedish governor seized the fort built by the Dutch, where Newcastle now stands. To end this trouble, Stuyvesant with 600 men sailed up the Delaware, re-captured the fort, and established the Dutch authority over the entire territory. After ten years of undisturbed quiet, in 1664 an English vessel arrived with an armed force under col. Nicholls, who demanded a surrender of the government, on the ground that the whole territory was given by royal charter to the duke of York. Stuyvesant at first refused, but finding the people anxious to exchange rulers, he yielded to the English demand. Thus abruptly terminated the Dutch control over the New Netherlands, and both the town and the territory was thenceforth called New York. Stuyvesant reported personally to the authorities in Holland, but soon returned to New York for the remainder of his life. He cultivated an extensive farm called the Bouwerij, giving its name to one of the busy streets of the city. A pear tree in his garden, which he brought from Holland, bore fruit more than 200 years. As an interesting relic of the past and of the man so highly and so justly honored, the city authorities for many years protected this pear tree by a tall iron railing. Stuyvesant died in 1682, aged 80 years. He was buried where St. Mark's Church now stands, and the elaborately inscribed stone that covered his grave is built into the eastern wall of the church.

STYE, or **STR**, is the popular name for a minute boil occurring at the edge of the eyelid, and known to surgeons under the term *hordeolum*. It begins as a small, red, tense swelling, accompanied with considerable itching, and a feeling of stiffness. As the inflammation goes on, the lid may become so swollen as to keep the eye closed. In a few days, matter forms, a white point appears at the apex of the swelling; and when the cuticle gives way, pus and a small slough of connective tissue escape, after which there is a general remission of the symptoms, and the eyelid soon resumes its natural state.

This common affection is chiefly confined to scrofulous and delicate children, but it is sometimes observed in persons of more advanced age. The best local treatment consists in the application of warm-water dressings with lint and oiled silk; and if any hardness remains after the discharge of the matter, dilute nitrate of mercury ointment may be applied. The sty should never be rubbed (notwithstanding the common prejudice in favor of rubbing it with a gold ring), nor, in general, is it necessary to puncture it. To prevent the recurrence of these little boils, attention should be paid to the diet, which should be abundant and nourishing, to the state of the bowels, and to the general health; and tonics may usually be prescribed with advantage. The old form of the word was *stian*. See Holland's *Plinie*, book xxviii. ch. xi.

STYLE, OLD AND NEW. See **CALENDAR**.

STYLITÉS. See **PILLAR SAINTS**.

STYLOBATE, the substructure of a temple beneath the columns. It is sometimes continuous all round the peristyle in the form of three high steps; sometimes it resembles a continuous pedestal along each side, with flights of steps at either end.

STYPTICS (Gr. *styptikos*, astringent) are agents employed in surgery for the purpose of checking the flow of blood by application to the bleeding orifice or surface. See **BLEEDING**.

STYRAX. See **STORAX**.

STYRIA (Ger. *Steiermark*), a duchy forming one of the German crown-lands of Austria, is bounded on the n. by upper and lower Austria, e. by Hungary and Croatia, s. and w. by Carniola, Carinthia, and Salzburg. Its area is 8,671 English sq.m., and pop. '90, 1,282,708, who are partly of German and partly of Slavic origin. Styria is a mountainous country, being traversed in the w. and center by branches of the Noric Alps, which spread out into numerous ramifications; while the southern portion between the Drave

and the Save is occupied by branches of the Carnic Alps. The climate of Styria, like that of most mountainous countries, is variable, but is generally raw and cold in the northern and more mountainous portion, and mild in the south. But in spite of its physical character, agriculture is so zealously prosecuted that $\frac{2}{3}$ of the country are under cultivation, producing rye, wheat, oats, and maize. Vines are largely cultivated in various parts, and orchards are numerous. The chief wealth of the country, however, lies in its mineral products, which include, besides immense quantities of iron, lead, copper, zinc, graphite, marble, limestone, and slate, with abundance of salt and coal. The chief industries are thus necessarily in connection with the production of iron and steel, and their manufacture into articles of such excellent quality as to be in great demand in other countries. There are also manufactures of brass and lead articles, earthenware, paper, tobacco, glass, and of cotton, linen, cloth, chemicals, etc. Styria was anciently divided between Noricum and Pannonia, and has generally followed the fortunes of the two provinces of Upper and Lower Austria.

STYX (Gr. *stug-*, to hate, abhor), a water-fall in Greece, near the town of Nonacris, in the n.e. of Arcadia, descends perpendicularly over lofty and precipitous rocks, and forms a small torrent, which falls into the Crathis. The scenery around it is weird and desolate, so that the Greeks regarded the Styx with superstitious awe; the water being supposed to be poisonous, and to break every vessel into which it was put, except those made of the hoof of a horse or an ass. It was reported that Alexander the great had been poisoned by it. It is now called *ta Mauraneria* (the black waters), and also *ta Drakoneria* (the terrible waters), the belief in its poisonous qualities still surviving.—In mythology the Styx was a river of Hades, round which it flowed seven times, and over which Charon (q.v.) conveyed the shades of the departed. As a goddess Styx was the daughter of Oceanus and Tethys, dwelling in a grotto at the entrance of Hades. She was the confirmer of the most solemn oaths of the gods.

SUABIA. See SWABIA.

SUAKIN, a seaport belonging to Turkey, on a small rocky island in the Red Sea, off the w. coast of Africa, but near the shore, in lat. 19° 7' north. It has a good harbor, and a considerable trade in gum, ivory, ostrich-feathers, coffee, etc., and it is a station for pilgrims passing to and from Mecca. Population estimated ('82) at 11,000.

SUARez, FRANCISCO, the most celebrated of the modern scholastic and polemical divines of the Roman Catholic church, was born at Granada in 1548. His early studies were singularly unpromising; and it is remarkable, in the history of a man afterward so eminent, that it was not without great difficulty, and after repeated trials, that he obtained admission into the society of the Jesuits. His later career, however, was brilliant, quite in proportion to the dullness of his first beginnings; and he taught philosophy and theology with remarkable success, first at Alcalá, and afterward at Salamanca, Rome, and Coimbra. The accounts given of his habits of application to study are almost beyond belief. He is said to have habitually devoted seventeen hours a day to study. Of his power of memory, the marvels related are scarcely less prodigious. He is said to have been able to repeat at will any portion of the whole 23 folio volumes of his own works, even to the quotations from the fathers and other theological writers with which they abound. Suarez may truly be described as the ablest and greatest of the modern scholastics; but in his works scholasticism appears in its best form; for although they abound in discussions uninteresting, and indeed unintelligible, to persons unacquainted with scholastic terminology, yet they may also be truly said on each subject to exhaust the whole of the learning, ancient and modern, which existed relating to that subject at the date of their publication. On the philosophy of the ancients, Suarez is especially copious and accurate; and of most of the modern German philosophy we may find the germ in the pages which he devotes to the account of the opinions of the ancients.

In the scholastic controversies on grace and free will, Suarez was strongly opposed to the Thomistic doctrine; but he also rejected the opposite system of Molina. See **MOLINISM**. The scheme of reconciling the freedom of the will with the efficacy of grace, and of saving at the same time, the doctrine of "special election," devised by Suarez, is called *congruism*, and is explained under the head **MOLINA**. The works of Suarez are entirely theological, or ascetic, and were printed in 23 volumes folio at Lyons, Mainz, and Venice. An edition in 28 volumes 4to was completed at Paris in 1861. His treatise *De Legibus* is much esteemed, and has been reprinted in England. Suarez died at Lisbon in 1617.—See Des Champs, *Vie de Suarez* (4to, Perpignan, 1671).

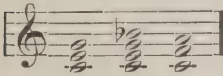
SÜBAHDAR was, under the mogul government, the title of a governor of a province. It now designates a native officer, holding a rank equivalent to that of captain under the European officers.

SUBALTERN, in the army, or rather in a regiment, is a company officer below the rank of captain; i.e., a lieutenant.

SUBDEACON is an assistant deacon,—an order in the Roman Catholic Church next inferior to the order of deacons. This office had its origin in the early Christian Church, developing from the last named of the following two orders of that Church: the presbyteriate and the diaconate. The order rendered important aid to the diaconate in the

distribution of the charities of the Church ; its members were also sent on distant and important missions. It was however regarded by the Church as an office of human invention and its introduction was gradual and with little uniformity. After the division in the Church, subdeacons were retained by the Greeks as guards at the gates of the sanctuary during mass ; they also prepared the sacred vessels at the Prothesis, but were not allowed to touch the pater and chalice when they contained the Holy Eucharist. With both Greeks and Orientals, the order is still one of the minor or inferior orders. Among the Latins they were allowed to prepare the sacred vessels, also the bread and wine, for the mass, and poured the water into the chalice at the Offertory, and sang the epistle. Under Pope Gregory the Great (q.v.) the office was somewhat enhanced by its inclusion under the operation of the law of celibacy, and about 1200, under Pope Innocent III. (q.v.), it was counted among the major, or holy orders. The office is not retained in the English Church.

SUBDOMINANT, in music, the fifth below the tonic; the note whose dominant is the tonic. Thus F is the subdominant of C, and C of G. One of the keys most nearly related to any key is its subdominant; and the easiest of all modulations is that from a key to its subdominant, which is effected by adding the dominant seventh to the common chord, and the resolution of this chord is the common chord of the subdominant e.g., in modulating from the key of C to the key of its subdominant F, we have



See DOMINANT.

SUBIA'CO (anc. *Sublaqueum*), a city of the province of Rome, on a hill by the Teverone, 30 m. from Rome. Subiaco possesses a fine cathedral, and many monuments of antiquity. There was a famous Benedictine monastery in Subiaco, and here, in the 15th c., one of the earliest printing-presses in Italy was established. Pop. '81, 6503.

SUBJECT. See OBJECT.

SUB-KINGDOMS, ANIMAL, a term applied to the great primary divisions of the animal world. The sub-kingdoms are also named "morphological types," and this latter term serves to indicate their constitution more definitely than the name "sub-kingdom." As an example of the manner in which a "sub-kingdom" of animals is constituted, we may select that of the *Annulosa* or *Articulata*, a group of animals which was clearly defined by Cuvier himself, and which has remained since his day, with few alterations, as one of the most distinctive groups of the animal creation. A lobster may be selected as a typical example of this group. In the detailed examination of this animal, we may note that the jointed nature of the tail is perceptible in the fore part of the body, notwithstanding that the latter region consists apparently of a single piece. A further examination of the lobster's body would reveal the fact that each joint and its appendages—the latter being "paired"—agrees in essential or fundamental structure with every other joint of the body. The investigation of the plan of structure of the lobster's frame would show a very typical arrangement of parts. The heart lies dorsally, or on the back. The digestive system occupies a median position; and the nervous system lies ventrally, or on the floor of the body. The nerve-axis of the lobster further consists, typically, of a double chain of nervous masses (or *ganglia*) united by nervous cords, and from which branches proceed to the various parts of the body. The ideas we may gain regarding the general type of structure of the lobster's body, or plan on which that body is built up, may be thus summarized: (1.) The body is jointed; (2) the joints and their appendages are fundamentally similar or homologous; (3) the heart lies dorsally, the nervous system ventrally, while the digestive system occupies the median position; (4) the appendages are in pairs. Now, if we examine the body of any insect, we shall find it to essentially resemble that of the lobster in the general arrangement of its parts. The body of a spider or a scorpion exhibits a similar disposition of organs to that of the lobster, and shows a fundamentally similar structure beneath variations in appearance and form; and a centipede's body would be found to be also constructed on the lobster-type. The barnacles, water-fleas, crabs, and a whole host of animals more or less nearly allied to the lobster, and belonging to the lobster's class (that of the *Crustacea*), exhibit a near relationship with the typical animal; while worms generally (leeches, earth worms, etc.,) would present a fundamental similarity in their characters to those described as existing in the lobster. We thus discover uniformity of type beneath variations in form and appearance, and it is exactly this uniformity or broad structural likeness between apparently different animals which enables us to group them together to form "sub-kingdoms" or "types." A sub-kingdom or type of animals may therefore be defined as consisting of a number of animals whose bodies are constructed on the same fundamental plan. Lobsters, crabs, barnacles, etc., insects, spiders, scorpions, centipedes, and worms thus form the "sub-kingdom" *Annulosa*, on account of their agreement in fundamental structure, and in the essential characters just described as being typically exhibited by the lobster. The animal world is thus divided into five or six sub-kingdoms. Between some of these groups recent research—altogether unfavorable to the construction of defined sub-kingdoms or types—has demonstrated connecting links to exist. But by the great majority of zoologists, the following divisions are recognized:

- I. PROTOZOA—Ex.: Sponges, infusoria, amœbæ, and other animalcular forms.
 II. CŒLENTERATA—Ex.: Sea-anemones, corals, zoophytes, jelly-fishes, etc.
 III. ECHINOZOA—Ex.: Sea-urchins, star fishes, crinoids, sea-cucumbers, tape-worms, flukes, etc.
 IV. ANNULOSA—Ex.: Worms, insects, centipedes, spiders, crustacea.
 V. MOLLUSCA—Ex.: Sea-mats, sea-squirts, lamp-shells, shell-fish, cuttle-fishes.
 VI. VERTEBRATA—Ex.: Fishes, amphibia, reptiles, birds, mammals.

SUBLAPSA'RIAN (Lat. *sub-lapsum*, after the fall), the name given to one section of the school of divines, who maintain the doctrine of absolute decrees of election and reprobation. It is possible to conceive God making such a decree in two different ways, either on the hypothesis of his foresight of the fall of Adam, and thus of original sin, or independently of such foresight on his part, and without any reference to such foresight, and entirely out of his own free will and determination. The sublapsarian system supposes the former; and thus refers the eternal election or reprobation of men by God to his foreseeing that all men would fall in Adam, and thus would deserve eternal reprobation. Out of the entire mass of mankind thus fallen, he freely pre-elects some to life, and equally freely predooms others to death. This distinction is not confined to the Calvinistic schools; it is also found among the Roman Catholics. See SUPRALAPSARIAN.

SUBLIMATION is a chemical process similar to distillation, but differing from it in the nature of the substances to which it is applied. While in distillation *liquids* are converted by the agency of heat into vapor, which is condensed in the liquid form usually by the cooling action of water; in sublimation, *solid* bodies are reduced by heat to the state of vapor, which reassumes the solid form on cooling. Sublimation is usually conducted in a single vessel of glass or iron, the product being deposited in the upper part of it in a solid state, while the impure residue remains at the bottom; but in the case of sulphur, the vapor is condensed on the walls of a large chamber. Iodine affords a good example of sublimation. On gently heating the lower part of a Florence flask containing a little of this substance, a purple vapor rises, which almost immediately condenses in small brilliant dark purple crystals in the upper parts of the flask, while any impurity that may be present remains at the bottom. Among the substances obtained by this process, and employed in the pharmacopœia, are arsenious acid, benzoic acid, corrosive sublimate, and sublimed sulphur.

SUBLIME. Objects indicating great power, vast expanse, or lofty elevation, excite in the beholder a feeling of pleasurable elation; and the name "sublime" is applied both to the objects and to the feeling.

The precise quality in things that arouse this mode of pleasurable excitement has been variously assigned. According to Burke, *terror* is, in all cases whatsoever, either more openly or more latently the ruling principle, or, at all events, one of the chief sources of sublimity: Blair suggested that *mighty power or force* is the cause; Payne Knight ascribed it to *mental energy*; Kaimes considers it due to *height or elevation*; Dugald Stewart, in an elaborate essay, affirms that *elevation* is the leading characteristic, and that expanse and power are sublime by suggesting or implying great height; sir W. Hamilton says that sublimity requires *magnitude* as its condition, and exists in three forms—space, time, and power.

The feeling itself has also been described variously. If this could be fixed, we should have a key to the objective quality. Longinus characterized it, in reference to literary composition, as "filling the reader with a glorying and a sense of inward greatness." Some would call it a "sense of security" in circumstances of terror or danger. Hamilton describes it as "a mingled feeling of pleasure and pain—pleasure in the consciousness of the strong energy, pain in the consciousness that this energy is vain." The connection with the sentiment of power is generally admitted; but as the comparison of the object with self suggests our own littleness at the same time, there may be a doubt as to whether the emotion is due to the power, to the littleness, or to the combination.

Referring to the generic sentiment of power, which is evidently at the foundation, we find that the feeling of superior might in ourselves is cheering, elating, stimulating; and that the sense of littleness or inferiority is a depressing and enfeebling state of mind, a state of pure pain, redeemable in certain circumstances by other feelings, as when our inferiority is only in the comparison with an object of love or veneration, or when it is the condition of some compensating superiority—"the courtier stoops to rise." The presumption, therefore, is that the elation of the sublime is connected with the notion of power. It may be felt although the power is not actually possessed, but imagined, borrowed, or conceived, through a sort of sympathy with the *appearances* of great power or might. If this account of the feeling be correct, power must be a principal quality in its objects; and if with this we combine voluminous sensation (and the corresponding ideas, vastness of expanse and greatness of time), we shall probably be able to explain the sublime in all its forms.

SUBLIME PORTE is the official name for the Turkish Government. The name comes originally from the chief gate of the seraglio, which is called the *Babi Humayun*, or Sublime Gate, and is the place where justice is publicly administered.

SUBMARINE NAVIGATION. When the diving-bell (q.v.) had shown that air for respiration can be supplied to persons placed in adequately arranged vessels under

water, ingenious men began to speculate on the possibility of navigating closed ships or boats in similarly exceptional circumstances. Cornelius Drebell made a vessel to be rowed under water in the time of James I. In 1774 an inventor named Day lost his life during an experimental descent in Plymouth sound, in a vessel of about 50 tons burden. Mr. Bushnell, of Connecticut, in 1775, and Robert Fulton, about 1796, contrived submarine vessels, intended to be used in warfare. The vessel patented in 1859 by Mr. Delaney, of Chicago, was egg-shaped in transverse section, and diminished nearly to a point at each end. Although this method of navigation has never been put into successful practice, there is very little doubt as to its practicability, at least for special purposes. Additional interest was given to this subject in 1897 by experiments made with small submarine vessels designed to attack war-ships, but no very definite results were obtained at first.

SUBMAXILLARY GANGLION, one of the four sympathetic ganglia lying in the cephalic region, sometimes called cranial ganglia; but the latter term is rather misleading, as none of the ganglia are within the cranial cavity. The submaxillary ganglion is situated above the deep portion of the submaxillary gland. See **SALIVARY GLANDS**, *ante*. It is connected by filaments with the lower border of the gustatory nerve (nerve of taste, supplying the tongue). It also receives motor filaments from the chorda tympani nerve, a branch of the facial. It is small, rounded, and of a reddish-gray color; its filaments of distribution, five or six in number, arise from the lower part of the ganglion, and supply the mucous membrane of the mouth and Wharton's duct, some being lost in the submaxillary gland.

SUBORDINARY, or **SUBORDINATE ORDINARY**, in heraldry, a name given to a certain class of charges mostly formed of straight or curved lines. Heraldry vary a little in their enumeration, but the following are generally held to come within this category: the bordure (q.v.); canton (q.v.); flanche (q.v.); fret (q.v.); fusil; gyron; inescutcheon (q.v.); lozenge (q.v.); mascle (q.v.); orle (q.v.); pall (q.v.); pile (q.v.); quarter (q.v.); tressure (q.v.). See also **HERALDRY**.

SUBORNATION or **PERJURY** is the offense of procuring another to take such a false oath as constitutes perjury (q.v.) in that other. It is a misdemeanor, punishable anciently by death; afterward banishment, or cutting out of the tongue; then forfeiture of goods; and latterly, as at present, by fine and imprisonment.

SUBPCENA, in American law practice, means the writ or process by which the attendance of a witness in a court of justice is compelled. It is a writ issued by a court commanding him to lay aside his business and all excuses, and attend at the time and place indicated, under penalty of a fine. If the witness is required to produce a document, the writ is called a *subpoena duces tecum*. If the witness do not attend, and has not a good legal excuse, such as dangerous illness, he may be sued in an action of damages or committed to prison.

SUBROGATION, in law, the substitution of another person in the place of the original creditor. The person thus taking the creditor's place succeeds to all the rights of the latter. Subrogation is taken from the Roman law, and belongs to equity rather than to common law jurisprudence. It may be conventional, where it takes place from the agreement of the parties; or may result from the action of the law, as where it takes place for the benefit of co-promisors and for the benefit of sureties against their principals. When a second mortgagee pays the first mortgagee's claim, he at once becomes the equitable assignee of the first and can compel actual assignment, and so in all cases where a prior creditor is paid by a subsequent one. If an entire debt be paid by one of several joint debtors, he is entitled to contribution from the others and subrogation takes place.

SUB ROSA, "under the rose"—i.e., between ourselves, or in secrecy. It was customary among the ancient Germans, on occasions of festivity, to suspend a rose from the ceiling above the table, as a symbol that whatever was said during the feast by those present would be afterward forgotten, or at least be kept as a secret among themselves.

SUBSCRIPTION, in law, a written contract by which a person agrees to contribute a sum of money for a specified purpose; as a subscription for a college or a newspaper. If the contract be legal and grounded on good consideration a subscriber may be sued for his subscription as soon as the condition upon which he made the promise is fulfilled. It has even been held that subscribers for a common purpose may be regarded as contractors with each other, and the consideration of each subscription the promises of all the other subscribers, so that each subscriber may be sued by all the others. This seems to be scarcely tenable, and it is customary to make subscriptions payable to a treasurer. Wherever action has been taken upon the subscription by the expenditure of moneys or otherwise, before notice received of the withdrawal of a subscription, there is a consideration sufficient to support the promise, which may then be enforced.

SUBSIDIES, a term in politics, used in two different senses: 1. It is applied in English political history to taxes levied not immediately on property, but on persons, in respect of their reputed estates in lands or goods; or customs imposed on any of the staple commodities in addition to the *costuma magna et antiqua*. Thus 30,000 sacks of wool were granted to Edward III. in 1340, in aid of the war with France. Subsidies were granted on various occasions to James I. and Charles II. 2. The same word is

used to denote money paid by one state to another, in order to procure a limited succor of auxiliary troops, ships of war, or provisions. In the time of the war with the revolutionists of France and Napoleon I., Great Britain furnished subsidies to foreign powers to a large extent, in order to engage them to resist the progress of the French. In questions regarding subsidies, it is held that the state furnishing the succor does not thereby become the enemy of the opposite belligerent; it may remain neutral in all respects, except as regards the auxiliary forces supplied. Such, for example, was long the attitude maintained by the confederate cantons of Switzerland: while granting troops to the various European powers, they were in the habit, at the same time, of preserving a rigorous neutrality. The service of Swiss regiments abroad is no longer sanctioned. The federal constitution of Switzerland, of Sept. 12, 1848, prohibited the conclusion of military capitulations; and on July 30, 1859, a proclamation was issued by the federal council, forbidding any Swiss subjects from taking service under a foreign power, without the authorization of the council.

SUBSTANCE, a word connected with certain discussions in logic and metaphysics. Substance is correlative with quality or attribute. Every substance must have attributes, and every attribute must be the attribute of some substance. The substance gold has the attributes weight, color, etc. But as every power or property of a thing, every way that the thing affects us, may be called an attribute or quality, if all the attributes are counted off, there is nothing left; and the question then arises: What is the *substance*? To avoid this seeming inconsistency, it was assumed that everything whatsoever possesses, besides its attributes, an unknown substratum that they rest upon, or inhere in—a mystical and inscrutable bond, that holds the attributes together, without being itself an attribute. This gratuitous assumption of what is, after all, a nonentity, was repudiated by Locke and others, who found a meaning for substance without departing from the knowable. Every object has some *essential* or *fundamental* quality, which being present, it preserves its identity; and which being removed, it is no longer the same object, but another. Thus the substance of body or matter is not the remnant after all the qualities are subtracted; it is the two fundamental and inerasable qualities, extension and resistance; size, shape, color, heat, odor, etc., may all be varied; but so long as extension and resistance in any degree are found, we have a piece of matter. On the same view, the substance of mind is whatever we regard as its fundamental essence, or distinguishing marks. We may adopt feeling, or volition, or intellect, or require a share of all three, according to our mode of defining the mind. It would, then, be a mere confusion of language to talk of feeling, volition, and intellect as *inhering* in mind; they *are* mind, and there is nothing besides.

Notwithstanding the obviousness of this explanation, the employment of the words substance and attribute has led to such an inveterate demand for something that shall underlie all attributes—a substance of body, and a substance of mind—distinct from anything meant by the names, that many philosophers have considered it necessary to preserve the phantom as a thing of belief, if not of knowledge. The doctrine of an unknowable substance in the abstract very early allied itself with the popular theory of the perception of a material world (see PERCEPTION), and the same arguments are good, for or against both. Other names for expressing the same contrast are *noumenon* and *phenomenon*. The phenomenon is what shows itself to our senses, or is conceived by our intelligence—the qualities of extension and resistance in body; and of feeling, etc., in mind. The noumenon is something apart and beyond, something inconceivable and unknowable, but which, say some, we are instinctively led to believe in. Thus, in the great question above alluded to—the belief of an independent material world—the phenomenal manifestations are inextricably involved with our mental powers of conceiving, and would vary, if these were to vary; consequently, they cannot be the absolute, independent, self-existent reality; which drives one school of philosophy upon the expedient of believing in such a reality, although it must be for ever incomprehensible to us.

SUBSTITUTE, MILITARY. In nations where conscription is resorted to for the supply of soldiers for the army, the lot often falls on those unwilling to serve in person. In such a case the state sometimes agrees to accept the services of a substitute who is of equally good physique. Unless the levy be very extensive, or the term of military service very long, substitutes are readily found among military men who have already served their prescribed period. Of course, the substitute must be paid for the risk he runs. His price depends, like all other saleable articles, on the demand and supply. In the United States, when conscription was resorted to, during the civil war, many of those who were drafted sent substitutes in their place. The price of a substitute rose toward the end of the war to \$1000 or \$1500.

SUBSTITUTION is one of the three principal methods employed in examining the chemical composition of organic bodies, and in tracing their relation to other compounds; the two other methods being those of *oxidation* and of *reduction*. Although the term is restricted to organic chemistry, the ordinary method of preparing insoluble inorganic compounds by double decomposition is in reality a case of substitution of one base or one acid for another. If, for instance, solutions of nitrate of lime and sulphate

of soda are mixed together, the resulting compounds are sulphate of lime and nitrate of soda, in which the lime is substituted for the soda, and the soda for the lime. In some cases an element may be replaced (or, more correctly, displaced) by a compound group; thus, cyanogen, CN, may take the place of oxygen, as, for example, in the reaction that ensues between hydrocyanic acid and red oxide of mercury, when cyanide of mercury and water are formed, as shown in the equation $2\text{HCN} + \text{HgO} = \text{Hg}(\text{CN})_2 + \text{H}_2\text{O}$. Similarly, the groups NO_2 , HSO_3 , and NH_2 may often be substituted for hydrogen. In various organic bodies, one or more atoms of hydrogen may be displaced by one or more atoms of chlorine, a fact which was originally observed by Gay-Lussac in noticing the action of chlorine on wax. The new product thus formed is almost always analogous in its nature to the compound from which it is produced; thus, according as the substance acted on by the chlorine is an acid or a base, the resulting product is an acid or a base, and the number of atoms is always the same in the original substance and the product. The following examples will elucidate the above remarks: If acetic acid, $\text{CH}_3 \cdot \text{CO}_2\text{H}$, be exposed to the action of chlorine, we obtain, according to the duration and modifications of the action, the two compounds, monochloroacetic acid, $\text{CH}_2\text{Cl} \cdot \text{CO}_2\text{H}$, and trichloroacetic acid, $\text{CCl}_3 \cdot \text{CO}_2\text{H}$, in the former of which, one atom, and in the latter, three atoms of hydrogen, are displaced by a corresponding number of atoms of chlorine. Ethyl chloride, $\text{CH}_3 \cdot \text{CH}_2\text{Cl}$, may be made to yield the following succession of compounds, in which a gradually increasing amount of the hydrogen is displaced by chlorine, until, in the final result, the hydrogen has altogether disappeared. The consecutive compounds thus resulting from ethyl chloride, $\text{CH}_3 \cdot \text{CH}_2\text{Cl}$, are (1) ethylidene dichloride, $\text{CH}_3 \cdot \text{CHCl}_2$; (2) trichlorethane, $\text{CH}_3 \cdot \text{CCl}_3$; (3) tetrachlorethane, $\text{CH}_2\text{Cl} \cdot \text{CCl}_3$; (4) pentachlorethane, $\text{CHCl}_2 \cdot \text{CCl}_3$; and (5) hexachlorethane, $\text{CCl}_3 \cdot \text{CCl}_3$. "The chlorine," says prof. Miller, "appears to have taken the place of hydrogen in the group without disturbing the relative position of the other elements which enter into its formation; just as a brick in an edifice may be conceived to admit of being removed, while its place is supplied by a block of wood or of stone, without altering the form or symmetry of the building." Substitutions of bromine and iodine for hydrogen may be effected in the same way as has been shown to occur in the case of chlorine. The study of the artificial formation of organic bases has led to the discovery of many remarkable instances of substitution products. If, for example, ethyl bromide, $\text{C}_2\text{H}_5\text{Br}$, is heated in a sealed tube with a solution of ammonia in alcohol, ethylamine hydrobromide is formed, and on distilling this with hydrate of potash, one of the products is a new base, ethylamine, $\text{C}_2\text{H}_5\text{NH}_2$, which may be regarded as ammonia, NH_3 , in which one atom of hydrogen has been displaced by one molecule of ethyl, C_2H_5 . By a similar proceeding, we may successively displace the second and the third atoms of the hydrogen in the ammonia; and we thus obtain two more complex bases, diethylamine, $(\text{C}_2\text{H}_5)_2\text{NH}$, and triethylamine, $(\text{C}_2\text{H}_5)_3\text{N}$.

SUBTRACTION, one of the four fundamental processes of arithmetic, is the diminution of a quantity by the removal of a certain portion of it. It is consequently the reverse of *addition*, and determines how much of any quantity remains after a certain quantity has been taken from it. In cases where the digits of the number to be subtracted are greater than the corresponding ones of the number to be diminished, two methods of operation may be adopted.

| (1) | (2) | (3) |
|------|---------------|---------------|
| 7324 | 7 (13) (12) 4 | 6 (13) (12) 4 |
| 1842 | (2) (9) 4 2 | 1 8 4 2 |
| 5482 | 5 4 8 2 | 5 4 8 2 |

For example, in subtracting 1842 from 7324, the numbers are written as in form (1). The method of operation usually followed is to make an addition mentally to the upper figure when necessary, and then compensate for this by an equivalent addition to the next under figure, as represented in form (2). Thus 10 "tens" are added to 2 "tens," to enable 4 "tens" to be subtracted; and this addition is compensated for by an equal increase of the under line by 1 "hundred," through the change of 8 "hundreds" into 9 "hundreds." The more simple and directly intelligible plan, shown in form (3), is to borrow a unit of the next higher degree in the upper line, care being taken to remember in the partial subtraction immediately succeeding, that the upper digit must be considered as less by unity than it appears.

SUB-TREASURY WAREHOUSE SCHEME. A plan favored by some members of the Farmers' Alliance (q.v.) in 1890-91, and embodied in a bill introduced into Congress by Mr. Vance, of South Carolina. The bill proposed that the Treasury Department establish in each county of the several states a branch to be styled a sub-treasury, on the petition of 100 or more citizens of the county. These sub-treasuries were to receive on deposit cotton, wheat, corn, oats, or tobacco from citizens, in return for which treasury notes up to the value of 80 per cent. of the value of the deposit would be issued to the depositor in the nature of a loan at the annual rate of one per cent. interest. On the repayment of the loan, the deposit of grain, etc., was to be returned.

SUBWAYS. The system of engineering *beneath* the public streets has not by any

means yet reached its full development. Subways for foot passengers are occasionally constructed in connection with railway termini; one such connects the Bishopsgate (London) station of the Metropolitan railway with the Liverpool street station of the Great Eastern; another connects two Victoria stations at Pimlico, belonging to different lines and companies. The *Tower Subway* is a remarkable instance of a passage under the Thames for foot-passengers. The Metropolitan or underground railway, opened in 1863, was the first example of its kind; the passengers going down-stairs from the side pavements to stations underneath the carriage-way. The pneumatic propulsion of mail-bags (see PNEUMATIC DISPATCH) has given rise to projects for a similar mode of propelling railway trains beneath streets and roads. One such, the Waterloo and Whitehall railway, was commenced about 1865, to pass under the Thames; want of funds led to its abandonment after shafts had been sunk. The term *subways* is usually applied, not to such tunneled passages for traveling, but to roomy archways that will contain sewer-pipes, water-pipes, and gas-pipes. It has been long considered a defective system that whenever such pipes need repair, the surface of the street has to be broken up to get at them, thereby causing great expense and great interruption to traffic. When the metropolitan board of works commenced their series of improvements, they resolved on the trial of subways for this useful purpose. They began with a new street, extending from Covent Garden market to St. Martin's lane, opened in 1861. Underneath the carriage-way of this street, there is a subway, a central arched passage or tunnel 12 ft. wide by 6½ ft. high; with arched side-openings for house service-pipes connected with the cellarage of the several dwellings. In this subway are water-pipes, gas-pipes, and electro-telegraphic wires, all easy of access by side entrances to the subway, of sufficient size to admit workmen, pipes, etc. In this instance, the main sewer is not in the subway itself, but underneath it, provided with man-holes, gullies, ventilating shafts, etc. A second example is afforded by Southwark street, lately formed from Blackfriars road to the southern foot of London bridge. Underneath this street extends a subway, excellently planned for the purposes above mentioned. Two street lamp-posts, of unusually elegant design, one at each end of the street, act as ventilating shafts for the subway, and there are other ventilators along the route, besides side entrances for workmen. A curious proof has been furnished, however, of the anomalies which so frequently mar our public works. In 1865, a gas company broke up the roadway, and broke through the well-built crown of the arch of the subway, to get at their gas-pipes for purposes of repair or adjustment. It was found, on investigation, that no one had power to prevent them. The act empowered the metropolitan board of works to make a subway for the use of gas companies, water companies etc.; the gas company, on the other hand, were empowered by *their* act to break up the public roadways to get at their pipes; the board could not compel the company to adopt the new plan, because the powers were only permissive, not obligatory. The water companies and gas companies fear incurring additional expense; and there is known to be a difference of opinion among engineers concerning the danger from leakage and explosion when the two sets of pipes are inclosed in the same archway.

The subway system, after overcoming these and other difficulties, has made a great advance within a recent period. Queen Victoria street, and several other new streets, have been provided with subways similar to that under Southwark street. The Victoria or northern Thames embankment presents some fine examples of subway engineering. Between the masonry of the river-wall and the former line of high water, there are no less than three tunnels or arched passages under the surface of the ground parallel to the course of the river. One is the metropolitan district railway; another is the low-level sewer of the Great Main Drainage system; while a third is a subway to contain gas and water-pipes, telegraph wires, etc. The most extraordinary plan, perhaps, ever seriously proposed in subway engineering is connected with the spot where Tottenham Court road, Euston road, and Hampstead road join. The Metropolitan railway is here flanked on either side by sewers; above it, but below the level of the street, are several gas and water pipes, drains, and ventilating shafts; while crossing immediately over the Metropolitan railway, at right angles, is the tube of the (still abortive, 1879) pneumatic dispatch (q.v.). Beneath all this is the section of another tunnel, intended to join the Midland and North-western railways with the South-eastern. Civil engineers and contractors are ready to grapple with the difficulties of this extraordinary work whenever financial circumstances are favorable. See RAILWAYS; TUNNEL. A system that appears to have been very successful in London, and which in consequence is advocated by many for introduction into New York as a means of solving the rapid transit problem, is that known from its promoter as the GREATHEAD SYSTEM. Mr. Greathead secured for his plan a parliamentary concession in 1888, and constructed a subway from the Monument to South Lambeth, a distance of more than three miles, at a depth below the streets of from 40 to 60 feet. It is composed of two tunnels which are circular and driven through sand, clay, or rock, by instruments prepared for the purpose; and which are composed, after the opening has been made, of sections of iron rings bolted together and with the interstices filled with tarred rope, and surrounded by a coating of Roman cement impervious to water. Hydraulic elevators carry passengers up and down shafts sunk from the street-level. The advantages of the Greathead system are

(1) the great depth which allows the tunnel to be constructed with little interference to buildings on the surface, and which consequently lessens expense; (2) the use of electricity as the mode of tractions, thus avoiding the noise, smell, and dampness inevitable when steam locomotives are used; (3) the higher rate of speed possible, it being on an average from 22 to 26 miles an hour. The original Greathead line was opened Nov. 4th, 1890; since which time, four similar projects have been started. See an article by Mr. Simon Sterne in the *Forum* for August, 1891.

SUCCESSION is a legal term used in Scotland, but not used technically in England, where the same subject is spoken of under the name of next of kin (q.v.) and descent; see also ADMINISTRATION AND ADMINISTRATOR; DISTRIBUTION, STATUTE OF; EXECUTORS; INTESTACY.

SUCCESSION ACTS. From a comparatively early period in English history, parliament occasionally exercised the power of limiting or modifying the hereditary succession to the throne. The first instance of such interference occurred in the reign of Henry IV., who possessed himself of the crown, to the prejudice of the descendants of Lionel, duke of Clarence, second son of Edward III. Act 7 Henry IV. c. 2 confirmed the title of that monarch, and declared prince Henry heir-apparent of England and France, with remainders to Henry IV.'s other children. Parliamentary interposition was subsequently exercised in the case of Henry VII. and in regard to the immediate successors of Henry VIII. The respective rights of James I., Charles I., and Charles II. were acknowledged by parliament; and in the case of Charles II. the crown was held to have devolved on him immediately on the death of his father.

The revolution of 1688 was founded on the so-called abdication of the government by James II. See ABDICATION. The convention bestowed the crown on William and Mary for life, and regulated the claims of Anne. On the impending extinction of the Protestant descendants of Charles I., the crown was settled by 12 and 13 Will. III. c. 2, in the event of the death of William and Anne without issue, on the next Protestant line, according to the regular order of succession—viz., the descendants of the electress Sophia of Hanover, granddaughter of James I.; and it was at the same time enacted, that whoever should hereafter come to possession of the crown, should join the communion of the church of England as by law established. This is the latest parliamentary limitation of the crown; but the right of parliament to limit the succession has been secured by 6 Anne, c. 7, which attaches the penalties of treason to the "maliciously, advisedly, and directly" maintaining, by writing or printing, that the king and parliament cannot make laws to bind the succession to the crown, and the penalties of a *præmunire* (q.v.) to maintaining the same doctrine by preaching, teaching, or advised speaking.

SUCCESSION WARS were of frequent occurrence in Europe, between the middle of the 17th and the middle of the 18th centuries, on the occasion of the failure of a sovereign house. The most important of these wars was that of the Orleans succession to the Palatinate (1686-97), closed by the peace of Ryswick; of the Spanish succession (1700-13); of the Polish succession (1733-38), closed by the peace of Vienna; of the Austrian succession (1740-48); and of the Bavarian succession (1777-79), called, in ridicule, the potato-war. Of these, the second and fourth were by far the most important, and a brief notice of their course and conclusion is subjoined.

SUCCESSION, WAR OF THE SPANISH, arose on the death, without issue or collateral male heirs, of Charles II., king of Spain, Nov. 3, 1700. The nearest natural heir to the throne was of the royal line of France, Charles's elder sister having married Louis XIV.; but to prevent any possible union of the two crowns, a solemn renunciation had been exacted both from Louis and his queen, for themselves and their heirs; and this renunciation having been ratified by the king and cortes of Spain, was made as binding as legal forms could make it. Failing the Bourbons, the next heirs were the descendants of the younger sister of Charles, who had married the emperor Leopold I., and from whom no renunciation had been exacted; and the only issue being a daughter, who had married the elector of Bavaria, and borne a son, Joseph Ferdinand, this prince was during his lifetime regarded both by Charles II. and the Spanish people as the rightful heir. But, dying in 1699 without issue, the question of succession was reopened, Louis XIV., failing his wife's rights, claiming for himself, as the son of Philip IV.'s elder sister (being, however, again legally barred here by another solemn renunciation); while the emperor Leopold, maintaining with justice that the Bourbons were by these two renunciations wholly deprived of all their rights of heirship, claimed the throne as the son of Philip IV.'s younger sister. The other powers of Europe, especially Britain, Holland, and Germany, warmly interested themselves in the matter, as a question of policy, and with good reason; for not only was the crown of Spain a valuable prize in itself, carrying with it the sovereignty of the Netherlands, the Milanese, Naples, and Sicily, and immense possessions in America, but its union with France or Austria would of a certainty endanger the independence of every other sovereignty in Europe. Both claimants bade for the support of the maritime powers, the one by renouncing his claims in favor of his second grandson, Philip of Anjou, the other by putting forward his second son, Charles, as his substitute, while both solemnly promised never to undertake the union of the two crowns. The Austrian party at first preponderated in Spain; but Louis, by able and unscrupulous policy, succeeded in undermining the Austrian influence at Madrid, and in having Philip declared the heir (Oct. 2, 1700). On the death of king Charles, a month

after, Philip appeared in Spain, and was well received by all classes, and at once recognized as monarch, an example gradually and unwillingly followed by all the European powers excepting the emperor; for at that time the dread of Louis XIV.'s power pressed like an incubus on the nations of Europe. However, the French monarch, by various ill-advised acts, chiefly by his support of the elder pretender (the son of James II.), whom he recognized as sovereign of Britain, and by occupation of the Netherlands and menacing treatment of Holland, stirred up such general resentment, that William III. was enabled to revive the *grand alliance*, and his successor, Anne, to join with Holland and Austria in declaring war against France and the "Spanish usurper," May 15, 1702.

Hostilities at once commenced; a combined British-Dutch-German army under Marlborough attacked the French in Belgium, and captured one by one their fortresses on the Maes, while the Reichs army (Germany having declared for Austria), under the Markgraf of Baden, crossed the Rhine, and took Landau. Austria herself had, however, commenced the contest in the previous year by sending into Italy prince Eugene (q.v.) of Savoy-Carignan at the head of a veteran army of 32,000 men, who did a good deal of hard fighting, with no adequate result. Meanwhile, the elector of Bavaria raised an army and declared for France, and a French army under Villars marched to join him. Both were kept in check by the Markgraf for some time; but, in the summer of 1703, Villars burst through the Black Forest, and joined the elector, with the view of penetrating through Bavaria into Austria, but his obstinate ally, the elector, was determined to invade the Tyrol instead, and join Vendome in northern Italy—a scheme which ended most disastrously; and Villars returned in disgust to France. In the Low Countries, Marlborough employed himself in gradually depriving the French of their strongholds: in Italy the Austrians were driven from point to point, till nothing remained to them but a few districts on the Po; they were, however, relieved toward the close of the year by the defection from France of the duke of Savoy, who joined the grand alliance Oct. 25, 1703, an event which compelled Vendome to return to Piedmont. The first great blow was struck in the following year, when the combined Austrian-German-British army, under Marlborough, totally defeated the French and the elector at Blenheim (q.v.), driving the débris of their forces almost to the foot of the Vosges. After this the French never obtained a permanent footing in Germany. The campaigns of Marlborough in Germany, and of Eugene in Italy, in 1705, were successful but not very important. The year 1706 was another great epoch in this protracted contest; the British and Dutch having freed the valley of the Maes, had forced the French into South Brabant, and Marlborough having, by a stratagem, caused them to march toward Namur, suddenly attacked them at Ramillies (q.v.), and, after a brief combat, put them completely to rout with great slaughter, the elector and Villeroy, the joint commanders, narrowly escaping capture. Louis hastily re-enforced his army, and recalled Vendome from Italy to take the command, a step which, however necessary, cleared the way for Eugene who completely out-generated his opponent Marsin, and after a memorable march of 34 days, appeared before Turin, and united with the duke of Savoy. The battle of Turin, in which the gallant Marsin was slain, was one of the most obstinate of the whole war, but its result was as decisive, and from this period the French power in northern Italy was shattered: and the following year saw the country completely cleared of both French and Spaniards. From 1706 the war in Germany was purely defensive, and no battle worthy of notice was fought. In Italy also the contest on the whole languished, though the Austrian arms were for the most part successful, Mantua and Naples (1708) being subdued, and the pope compelled to preserve neutrality by dread of another sack of Rome. But since the commencement of 1704, another theater of war had been established by the landing of the archduke Charles at Lisbon with 8,000 British and 6,000 Dutch troops, who were joined by the Portuguese (their king having acceded to the alliance against France), and invaded Spain from the west; but nothing of consequence was accomplished till a landing had been effected by the earl of Peterborough (q.v.), with a small body of troops, in Catalonia. Then attacked both from the w. and e., the Bourbon forces were beaten and driven across the Pyrenees, and it was only after the departure of Peterborough that Berwick (q.v.) made head against his antagonists. By his victory at Almanza (April 25, 1707), he recovered the whole of Spain except Catalonia. In 1710 Berwick finally left Spain; and the Carlists under Stanhope and Starhemberg again got the upper hand, repossessing themselves of the e. of Spain, and of Madrid (Sept. 28). But the arrival of Vendome speedily changed the face of affairs. Stanhope was defeated and captured (Dec. 9) at Brihuega, and Starhemberg was forced to retreat on the following day. The war was thenceforth confined to Catalonia, and was distinguished by no noteworthy incidents. The most important part of the struggle had been meanwhile taking place in the Netherlands, where Marlborough (1707) drew up in concert with Eugene a secret plan of operations which affected a division of the Moselle army under the elector and Berwick from that of the north under Vendome; whereupon the British and Germans swiftly uniting fell upon Vendome's army at Oudenarde (q.v.) (1708), and before Berwick could come up to its aid, inflicted upon it a severe defeat. The capture of Lille, Ghent, and Bruges necessarily followed. France now began to show symptoms of exhaustion, and made overtures of peace, but these being chiefly illusory, were rejected; and the emperor having largely re-enforced Eugene, the allies took the field with 110,000 men,

while the French, equal in strength, were now directed by Villars, the most enterprising and fortunate of their generals; but his star, which had hitherto been constantly in the ascendant, fell before that of Marlborough at Malplaquet (q.v.) (Sept., 1709). After some further campaigning, besieging, and negotiating, the opportune death of the emperor (April 17, 1711) rescued France from the brink of destruction; for Britain became immediately lukewarm in support of a cause which would effect the reunion of Austria and Spain; and the Tories having come into power, private preliminaries of peace were signed between Britain and France, Oct. 8, 1711. Eugene, however, continued the war, aided by Holland, and captured Quesnoy; but the defeat and capture of the earl of Albermarle and the British contingent at Denain (July, 1712) so weakened his force, that he was compelled to give way; and in the following spring the Dutch joined the British as parties to the peace of Utrecht (q.v.). The emperor Charles was also forced to conclude a treaty of peace at Baden, Sept. 7, 1714, which ended the struggle, leaving Philip in possession of the Spanish throne (see *UTRECHT*); while Austria obtained the Spanish Netherlands and the Milanese.

SUCCESSION, WAR OF THE AUSTRIAN. The death of the emperor Charles VI. (Oct. 20, 1740), by which the male line of the house of Hapsburg became extinct, was the signal for a general uprising of the powers of Europe, some to prey on the Austrian possessions, and others to aid the eldest daughter and heir of the deceased emperor. The probability of such a contingency had long been foreseen by Charles VI., for as early as 1713 he had published a *Pragmatic Sanction* (q.v.), stipulating that, in default of male heirs, the whole of his dominions should descend undivided to his eldest daughter, Maria Theresa (q.v.); and it was almost his sole aim, during his subsequent reign, to gain the consent of all parties having proximate claims to any of the Austrian domains, and of the principal powers of Europe, to this arrangement. The elector of Bavaria, Charles Albert, alone refused to resign his pretensions. On the death of her father, Maria Theresa intimated her accession to the various European powers, and from all of them, except France and Bavaria, received assurances of good-will and support; but notwithstanding, two months did not elapse till Frederick II. of Prussia, without a declaration of war, invaded Silesia. The Austrian treasury was at this time exhausted, and the army much disorganized; so that little or no effective resistance could be made to the Prussians; while the state of alarm into which this sudden attack had thrown the court of Vienna was increased by doubts as to the intentions of France. These doubts were soon resolved by the latter, in the spring of 1741, forming a confederacy of all the claimants to the Austrian dominions—the electors of Bavaria and Saxony, sons-in-law of the emperor Joseph I.; Philip V. of Spain; Charles Emmanuel of Sardinia, who claimed the Milanese; and Frederick II. of Prussia, who *now* demanded almost the whole of Silesia. On the other hand, Britain granted Maria Theresa an annual subsidy of £300,000; the Dutch were willing to aid her when opportunity offered; and Hungary gallantly responded to her pathetic appeal by sending in thousands her motley population, Magyars, Croats, Slavs, and Toltatches, to fight in defense of their heroic queen. Meantime the Bavarians, in conjunction with the French under Belleisle, overran the greater part of Bohemia. This invasion compelled the queen to buy off her most formidable opponent, Prussia, by the surrender of Silesia and Glatz; and then, while prince Charles of Lorraine kept the French at bay in Bohemia, Khevenhuller, the most enterprising of the Austrian generals, advanced up the valley of the Danube, captured 12,000 French in Linz, overran Bavaria, and on the very day of the elector's coronation as the emperor Charles VII., took Munich his capital (Feb. 12, 1742). But this great success alarmed Frederick II. for the security of his new possessions, and abruptly breaking the treaty, he poured his forces into Bohemia and upper Austria, and gained the battle of Chotusitz (May 17). The same year witnessed increased activity on the part of Britain (the Walpole administration being now in power) and Holland on behalf of Austria; the expulsion of the French and Bavarians from Bohemia; the severance of the king of Sardinia from the coalition against Austria, produced by the bribe of some districts of the Milanese, which, however, he did not obtain till some time afterward; the enforcement of neutrality upon Naples by the threatening attitude of a British fleet off the capital; and, on the other hand, the recovery of Bavaria by the elector.

In May, 1743, Bavaria again fell into the hands of prince Charles and Khevenhuller; count Saxe was driven with great loss from the Palatinate; the "emperor" Charles Albert and the Swedes, disgusted at their ill-success in the war, retired from the contest, so that France and Spain now remained the sole representatives of the once mighty coalition. In 1744, France and Britain, which had hitherto engaged in the conflict only as allies, declared war on each other; and the latter proceeded to destroy piecemeal the French and Spanish shipping on the high seas, and to attack their colonial possessions. For this, however, the successes of Saxe in the Netherlands were a compensation. However, the great successes of Austria on the Rhine, and the ill-concealed ambitious projects of Maria Theresa, again alarmed Frederick II. for Silesia; and he resolved on another attempt to rivet his hold on the much-coveted province before it was too late. Accordingly, he concluded at Frankfort (May 13, 1744), a secret convention with France, the emperor, the elector-palatine, and the king of Sweden. Bursting into Bohemia with his usual celerity, Frederick II. forced the Austrians at once to return from Alsace, thus enabling the elector to recapture Bavaria; but before prince Charles had time to reach

Bohemia, a fresh levy of 44,000 men, which had been raised by the chivalrous and patriotic Hungarians, joined by 6,000 Saxons, had reached the Prussians, and by cutting off their supplies, and capturing their stragglers and foraging parties, compelled them to evacuate the kingdom with considerable loss. In Italy, the Spaniards, who were now joined by the Neapolitans, were defeated repeatedly, and compelled to retreat down the peninsula; and the king of Sardinia succeeded in preventing the French from effecting a permanent lodgment in n.w. Italy. In January, 1745, the emperor-electoral died, and his son, Maximilian Joseph, profiting from his father's misfortunes, declined to take part in the contest, or to allow himself to be nominated emperor, and made peace with Austria. Frederick II., displeased with the meddling and overbearing conduct of France with respect to the approaching imperial election, also sought to come to terms with Austria, by the mediation of Britain, and the peace of Dresden (Dec. 25, 1745) finally withdrew Prussia from the conflict. In Flanders, the fortunes of Austria also declined; and after the victory of Fontenoy (May 11, 1745) she could not prevent Saxe from capturing the chief Belgian fortresses in succession. In Italy, also, fortune declared for the coalition; for the Spanish-Neapolitan army, now re-enforced by the Genoese and Modenese—70,000 men in all—defied all opposition, overran the whole of Lombardy and much of the Sardinian territories, driving the king under the walls of his capital. Similar reverses befell the allies in Flanders during the campaign of 1746; but these were more than counterbalanced by the great successes obtained in Italy, where all the lost fortresses of Lombardy, Parma, and Guastalla, were recaptured, the coalition army totally routed in a great battle near Placentia (June 16), and Genoa overrun and occupied. Another of fortune's favors to Austria was the death of Philip V. of Spain (July 9), which, by depriving that arch-plotter, his queen, of the supreme power, considerably diminished the zeal of the Spanish court in the prosecution of the war. In 1747, the Dutch, who had hitherto escaped the ravages of war, were made practically acquainted with them by Saxe, who, having completely subdued the Austrian Netherlands, invaded and overran Dutch Flanders, routed the unfortunate duke of Cumberland at Laffeldt (July 2), while his celebrated chief of engineers, count Lowendal, after a two months' siege, took Bergen-op-Zoom, Cohorn's masterpiece, a fortress believed by the Dutch to be impregnable. At the commencement of 1748, Britain, France, and Holland sought to bring about a peace, and agreed among themselves to certain preliminaries, which were submitted to Austria and Sardinia; but as one of them was the surrender of Parma and Placentia to Don Philip of Spain, the former refused her consent; and her two allies, disgusted at her disregard of the sacrifices they had made on her behalf, at once signed the preliminaries (April 30), and Austria sullenly followed suit on May 18. Much discussion followed, but on Oct. 18, 1748, the treaty of Aix-la-Chapelle (q.v.) put an end to this most disastrous war, which left the Hapsburgs in possession of their hereditary dominions, with the exception of Silesia and some of their Italian provinces. See AIX-LA-CHAPELLE.

SUCCINIC ACID, $C_2H_4(CO_2H)_2$, derives its name from its having been originally found in amber (Lat. *succinum*), and is one of the group of dibasic acids of the oxalic acid series, whose general formula is $C_nH_{2n-2}O_4$. Succinic acid occurs as a natural constituent not only in amber, but also in the resins of many of the pine tribe, in the leaves of the lettuce and wormwood; and, in the animal kingdom, it has been detected in the fluids of hydatid cysts and hydrocele, in the parenchymatous juices of the thymus gland of the calf, and of the pancreas and thyroid gland of the ox.

One of the most important points in connection with succinic acid is its convertibility into tartaric acid, while tartaric acid may in its turn be reconverted into succinic acid.

SUCCOTASH (Indian, *msickquatash*) is an article of food common in the United States, and is made of corn and beans boiled together. The dish, as well as the name, originated with the Narragansett Indians.

SUCCORY. See CHICORY.

SUCCOTH, or SUKKOTH, one of the Egyptian "treasure cities" built by the captive Israelites for Pharaoh. The archaeological interest which has always surrounded the locality of this city was renewed by the publication of *The Store City of Pithom and the Route of the Exodus*, by Edouard Naville, of the Egyptian exploring expedition, 1885. It is shown by reasonably conclusive evidence that the modern settlement of Tell-el-Maskhûtah is the site of the ancient Succoth. The "stone of Pithom," unearthed by M. Naville, is as important a discovery as was that of the Rosetta stone, as it bears strong testimony to the identification of the modern with the ancient site. On this stone the god Sept is called "the great god of Succoth;" Rameses II. is styled "the lord of Succoth;" another inscription reads: "All the priests who go into the sacred abode of Tam, the great god of Succoth;" finally, the hawk of black granite engraved on the stone, and known to have been the emblem of Harmechis, with the oval of Rameses II., seems to confirm the biblical record, and to fix the date at that given by Old Testament scholars as the time of the building of the city. The hieroglyphic form of the name is Thurku, or Thukut, which, by well-understood philological laws, was rendered Succoth by the Hebrews. It is also discovered that Tell-el-Maskhûtah is the site of the Heroopolis of the Greeks.

SUCHET, LOUIS-GABRIEL, Duke of Albufera, and marshal of France, was descended from an honorable family, and b. at Lyons, Mar. 2, 1770. He volunteered as a private into the cavalry of the Lyons national guard in 1792, and subsequently became attached to the army of Italy. His rare intelligence and brilliant valor, displayed at Lodi, Rivoli, Castiglione, Arcola, and in numerous battles of less note, laid the foundation of his military reputation, and in 1798 he became gen. of brigade. The able manner in which he, with a force not one-sixth of that of the Austrians, kept Melas in check (1800), preventing the invasion of the s. of France, and ultimately capturing 15,000 prisoners, is one of the most brilliant military feats on record. Suchet also took a distinguished part in the campaigns against Austria (1805) and Prussia (1806), and was subsequently (April, 1809) appointed generalissimo of the French army in Aragon, where, for the first time, he appears as holding an independent command. The part of Spain committed to his charge, though inhabited by a people distinguished by their obstinacy and patriotism above all others in Spain, was completely subdued, more, however, through his just and able administration, and the strict discipline which he maintained, than by military talent. The latter quality he was only called upon to exercise against Spanish troops, which he had little difficulty in annihilating. In the first few days of 1812 he conquered Valencia, and obtained in addition to his dignity of marshal (July 8, 1811) that of duke of Albufera, and the grant of a magnificent domain. The five campaigns which he made in the peninsula are considered perfect models of the kind of service he had to perform—viz., to rivet the chains of a foreign domination on the necks of a patriotic and high-spirited people. The details have been well given by him in his *Mémoires sur ses Campagnes en Espagne* (Paris, 1829–34, 2 vols. with atlas). But the misfortunes of the other French armies in Spain compelled Suchet gradually to relinquish all his conquests. He was created a peer by Louis XVIII., but took service under his old master after his return from Elba, and was charged with the defense of the s.w. frontier. Deprived of his peerage at the second restoration, he did not return to court till 1819, when it was restored, and he soon rose high in royal favor. He died at the château of Saint Joseph, near Marseilles, Jan. 3, 1826. Napoleon's high opinion of Suchet's military talents is recorded by O'Meara and Las Casas, and, according to his classification, Suchet ranked second, Massena being first.—His son and successor in the dukedom of Albufera was a member of the corps législatif, and a supporter of the Napoleonic policy under the emperor Napoleon III.

SUCKER STATE. See STATES, POPULAR NAMES OF.

SUCKING-FISH, a name sometimes given to the remora (q.v.), and to fishes of the family discoboli (q.v.), which have a sucker formed by the union of the ventral fins, and are capable of attaching themselves by it to stones or other substances. The best known of the British species, and the only one which is of any value as an article of food, is the lump sucker (q.v.).

SUCKLING, Sir JOHN, one of the brilliant cavalier poets of the court of Charles I., was born at Whitton, in Middlesex, and baptized Feb. 10, 1608–9. His father, also a knight, held office as a secretary of state, and comptroller of the household, but died in 1627, when the poet was in his eighteenth year. The latter inherited large estates; and having completed his education at Trinity college, Cambridge, he went abroad, and served for some time in Germany under Gustavus Adolphus. He returned about 1632, and was soon distinguished for his wit, gallantry, and lavish expenditure. To aid the king against the Scots he raised a troop of 100 horsemen, whom he clad in a rich and gaudy uniform of white and red, with plumes of red feathers in their caps. This loyal corps is said to have cost the poet about £12,000. They rode n.; but no sooner had the cavalry come within sight of the Scots' army at Dunse than they turned and fled without aiming a blow! This disgrace gave occasion to numerous lampoons, and to a clever though coarse ballad against Suckling's gay horsemen; but in reality they behaved no worse than the rest of the English army. Their loyal commander next joined in a scheme to rescue Strafford from the Tower, and this being discovered, he fled for safety to the continent. He died, while yet in the flower of his life and genius, in 1641 or 1642. Various accounts are given of the circumstances attending his death, but the most painful of these, viz., that he poisoned himself in Paris, is confirmed by family tradition. See the memoir by the Rev. Alfred Suckling (1836), prefixed to a volume of *Selections from the Works of Sir John Suckling*. He had probably run through his fortune, and dreaded want, as well as despaired of the success of the royal arms. The works of Suckling consist of four plays, now utterly forgotten, a prose treatise entitled *An Account of Religion by Reason*; a collection of *Letters*, written in a stiff, artificial style; and a series of miscellaneous poems, beginning with *A Session of the Poets*, published in 1637, which is original in style, and happily descriptive of the author's contemporaries. But the fame of Suckling rests on his songs and ballads, which are inimitable for their ease, gayety, and pure poetic diction. His ballad of *The Wedding* is still unsurpassed, and one simile in his description of the bride—

Her feet beneath her petticoat,
Like little mice, stole in and out,
As if they feared the light—

has had the honor of being copied by Herrick and Congreve.

SUCRE. See CHUQUISACA.

SUCRÉ, ANTONIO JOSÉ DE, 1793-1830; b. Venezuela; educated at Caracas. When 18 years old he entered the patriot army, and in 1822 held a command at Pichincha. In 1823 he became the chief of the Peruvian patriots, and the next year won the battle of Ayacucho, which brought about the independence of Peru. By the legislature of Bolivia he was chosen president for life in return for his efforts in rendering that republic free. In 1827 an insurrection took place in which Sucre was wounded. He then resigned, engaged in the war between Colombia and Peru, and defeated the Peruvian army under Lamar at Tarqui, 1829. He was chosen president of the first congress of the republics which met in Bogota, 1830, and on his return was assassinated, it was said, by order of Obando.

SUCTORIA, an order of insects, containing only those forming the Linnæan genus *pulex*. See FLEA.

SUDAMINA, or MILIARY ERUPTION, is one of the diseases of the skin belonging to the class *vesicule*, or *vesicles*. The former name is derived from the fact that the disorder is always accompanied with profuse sweating; while the latter has reference to the size of vesicles, which do not exceed those of a millet-seed. The vesicles are most abundant on the neck and trunk, and are sometimes, but not always, attended with itching. They almost always occur in association with febrile disorders, which, however, do not seem in any way modified by these occurrences. The only known condition that favors their production is copious and prolonged sweating. They sometimes appear in health during the summer heat, when strong exercise has induced copious sweating. Pathologically this disease is of so little importance that it is unnecessary to notice its treatment. It is, however, sometimes useful as a sign in diagnosis, especially in typhus and typhoid fevers.

SUDAN. See SOODAN.

SUDBURY, a municipal borough of Suffolk, 16 m. s. of Bury St. Edmunds, on the left bank of the Stour, across which a bridge connects the town with the suburb of Balingdon in Essex. The silk and bunting manufactures are the most important branches of industry. There are also brick-works, in which the white clay used is notable for its purity. Malting is carried on. Sudbury was one of the first towns into which the woolen manufacture was introduced by the Flemings. Pop. '81, 6584; '91, 7059.

SUDDEN DEATH may be induced by natural or by violent causes, and the detection of the true cause is obviously of very great importance, since the acquittal or conviction of a suspected person may depend upon it. Sudden death may occur naturally from syncope (fainting or swooning), from asphyxia (literally pulselessness), or, more correctly, apnæa (privation of breath), or from coma (insensibility). Syncope, or sudden cessation of the heart's action, may occur, as Dr. C. J. B. Williams points out in his *Principles of Medicine*, in two ways: (1.) By the heart losing its irritability (or becoming paralyzed), so that it ceases to contract; and (2.) by its being affected with tonic spasm, in which it remains rigidly contracted, losing its usual alternation of relaxation. Sudden death from asphyxia, or, more correctly, from apnæa, occurs when, from any cause, the entrance of air into the lungs is prevented. It is not so often witnessed as a result of disease as of accident. It is sometimes caused by a spasmodic closure of the chink of the glottis (see LARYNX). Sudden death from coma is liable to occur in apoplexy and injuries of the head.

In its relations to medicine and medical jurisprudence the subject of this article has been fully discussed by Herrick and Popp, *Der plötzliche Tod aus inneren Ursachen* (1848).

SUDERMANN, HERMANN, German author, born at Matzicken, in East Prussia, Sept. 30, 1857. After attending the universities of Königsberg and Berlin, he decided to devote himself to literature, and for some years was editor of a small newspaper, the *Deutsches Reichsblatt*. During this first period he wrote a large number of stories which passed unnoticed, and of plays which were never produced. But the production in 1888 of his social drama *Ehre*, in which he identified himself with the naturalistic movement, met with a remarkable success, and brought him into the front rank of contemporary German writers. He has since published a long line of novels and short stories, *Frau Sorge* (1888); *Der Katzensteg* (1889); *Im Zwielicht* (1890); *Iolanthes Hochzeit* (1893); *Es War* (1894), which have all gone through numerous editions; also a tragedy, *Sodom's Ende* (1890); and the following plays, *Heimat* (1893); *Die Schmetterlingsschlacht* (1894); *Das Glück im Winkel* (1895); *Morturi* (1896). The success of *Ehre* was repeated only in *Heimat*, which under the title of *Mayda* has gained widespread fame as a favorite rôle of both Eleanora Duse and Sarah Bernhardt.

SUDETENGEIRGE, the most important mountain-range of Germany, dividing Prussian Silesia and Lausitz from Bohemia and Moravia, and connecting the Carpathians with the mountains of Franconia. It does not form a continuous chain except in the middle, where it is known under the names of Riesengebirge (q.v.) and Isergebirge; the ends, both toward the n.w. and s.e., broadening out into great rugged hilly plateaus, with broken chains and isolated peaks. The Sudetengebirge are composed chiefly of granite, gneiss, mica-schist, and porphyry, with superimposed beds of basalt and coal, and are clothed with pines to a height of between 2,000 and 3,000 feet. They are rich in minerals, especially in the metals, iron, lead, copper, zinc, tin, cobalt, with some silver and gold. Schneekoppe (Snow-peak) in the Riesengebirge, about 5,000 ft. high, is the cul

minating point in the whole range.—The name Sudetengebirge is applied in a narrower sense to the s.e. portion of the range separating Silesia from Moravia.

SU'DRA is the name of the fourth caste of the Hindus. See **CASTE**.

SUE, MARIE JOSEPH EUGÈNE, a well-known French novelist, was born at Paris Dec. 10, 1804. His father, Jean-Joseph Sue, was one of the household physicians of Napoleon, and he educated his son for his own profession. At the age of twenty the young man became an army-surgeon. In this capacity he served in the French expedition to Spain, under the duke of Angoulême, in 1823. Subsequently he transferred himself to the navy; and in 1828 was present at the battle of Navarino. In 1829 his father died, leaving him a handsome fortune, on the acquisition of which he ceased to practice his profession. After coquetting a little with art he betook himself seriously to literature, and very soon, in the department of fiction, he achieved a considerable popularity. His earlier efforts were sea-stories, somewhat after the manner of Cooper, or romances in imitation of Scott; and though in both fields he displayed talent, his true power was scarcely as yet developed. Something of it may, however, be traced in his *Mathilde, ou les Mémoires d'une Jeune Femme*, published in 1841; but it was first decisively made manifest in the famous *Mystères de Paris*, which began to appear the year after in the columns of the *Journal des Débats*. The furor of excitement occasioned by this work and its successor—*Le Juif Errant*—which appeared in the *Constitutionnel*, not only in France but elsewhere, has seldom, perhaps, been exceeded; and for both the writer received large sums of money. In 1846 his *Martin, l'Enfant Trouvé* was issued; in 1847-8 appeared *Les Sept Péchés Capitaux*; and in 1852 he published *Les Mystères du Peuple*, his last work of any importance. Throughout Sue's latest works there runs a vein of socialism; and at the revolution of 1848 he allied himself with the extreme sect of the republicans. On April 28, 1850, he was elected deputy to the legislative assembly for the department of the Seine, and was assiduous in his duties as such till the *coup d'état* of Dec., 1852, by which he was driven into exile. He retired to Savoy; and at Annecy he died July 3, 1857.

In the writings of Sue great power is displayed; but it is rather of the unhealthy kind, and depends for much of its effect on vicious sources of interest. His books are read once with a fever-heat of curiosity, and scarcely bear reproof.

SUE'CA, a t. of Spain, in Valencia, and 23 m. s. of the city of that name, on the Jucar, about 4 m. from the Mediterranean. Brick and tile works are in operation, and there are several flour and rice mills. Pop. 11,340.

SU'ET is a variety of solid fatty tissue, which accumulates in considerable quantity about the kidneys and the omentum of several domestic animals, especially the ox and sheep. Beef suet is extensively used in cookery, while purified mutton-suet under the name of *Sevum Præparatum* occurs in the Pharmacopœia, and is obtained by melting and straining the internal abdominal fat. It consists of a mixture of ordinary animal fats with a great preponderance of the most solid of them, viz., stearin, which constitutes about three-fourths of the whole. The pure suet of the Pharmacopœia is "white, soft, smooth, almost scentless; and is fusible at 103°." It is used as an ingredient in cerates, plasters, and ointments. Ordinary melted suet is frequently employed in the same manner as lard, to preserve potted meats or fish and similar articles from the action of the air.

SUETO NIUS, GAIUS TRANQUILLUS, son of Suetonius Lenis, a tribune of the 13th legion under Otho, was born probably a few years after the death of Nero. He is known to us chiefly as a Roman historian and miscellaneous writer, for his merits as which he is highly praised by the younger Pliny. He was also, it is supposed, a teacher of grammar and rhetoric, and a composer of exercises in pleading; nay, from a letter of Pliny's to him, it may be gathered that he sometimes pleaded causes in person. Pliny procured him the dignity of military tribune, which, by Suetonius's desire, he got transferred to another. Though childless, Suetonius was, through the same friendly agency, presented by Trajan with the *jus trium liberorum*, which, in that reign, was only to be had by great interest. He was afterward secretary of the emperor Adrian, whose favor he had secured. The date of his death is unknown. All his works (among which, as we learn from Suidas, there were several on topics usually treated by grammarians) have been lost, except his *Lives of the Cæsars*, his *Lives of Eminent Grammarians*, and (in part only) his *Lives of Eminent Rhetoricians*. It is by the first of these works that he is most favorably known, replete as it is with information about the twelve Cæsars, from C. Julius to Domitian, which is to be had nowhere else, and abounding with anecdotes which, while they too often prove the profligacy of his heroes, testify to the impartiality of their chronicler. From a period long before the renaissance to the present, these "Lives" have always been favorite reading, and have found numerous editors, the best of whom is still Burmann (Amsterdam, 1736), and numerous translators into nearly every European language. The standard text is that of Roth (Leips. 1836).

SUE VI, first mentioned by Cæsar, in whose history (*De bello Gallico*) the name is employed as the collective designation of a great number of Germanic peoples. They occupied a district of indefinite extent on the eastern side of the Rhine, and may have been the same tribes as those subsequently known as Chatti, Longobardi, etc. Cæsar

states that their territory comprised 100 cantons, and was densely wooded, that they had towns (*oppida*), but no strongholds, and that every year a part of the population left their homes to seek employment in war. The Suevi of whom Tacitus speaks (*Germania*, 38, etc.) seem to have dwelt n. and e. of the Suevi of Cæsar, extending as far as the Elbe and the Baltic, which Tacitus calls the "Suevic sea." The peoples united under the rule of Maroboduus, the Marcomannic chief, were Suevic, and hence the Marcomanni and Quadi, who figure in the reigns of Marcus Aurelius and Aurelian, are often called Suevi. After the name had fallen into disuse as a collective designation, it re-appeared (second half of the 3d c., *Amm. Marc.*, etc.) as the name of a people occupying the same territory as the Suevi of Cæsar, who appear, however, to have been a mixed race made up of adventurers from different parts of Germany, and who probably took the name of Suevi after possessing themselves of the country. We find them in alliance with the Burgundians, Alemanni, Alani, Vandals, etc. They are among the most notable of the barbaric peoples that broke up the Roman empire in the n.w. and west. Bursting through the passes of the Pyrenees (409 A.D.), they along with the Vandals, overran and wasted Spain (q.v.). Those who remained at home in Germany seem to have spread during the 5th c. e. to the Neckar and the Rauhe Alps, and s. as far as Switzerland. The mediæval Swabians were their direct descendants.

SUEZ; until recently, a small, ill-built, wretched-looking town, on an angle of land near the northern extremity of the gulf of Suez, 76 m. e. of Cairo, with which it is connected by railway. The pop. was officially returned in 1882 as 10,919. It is walled on all sides but that toward the sea, has an indifferent harbor, but a tolerably good quay. Suez of late has been greatly improved. The town is divided into the Arab quarter, with seven unimportant mosques, and the regularly laid-out European quarter, with the store-houses of the Peninsular and Oriental Steamship Co. The bazars are provided with clarified butter from Sinai, with fowls, grain, and vegetables from the Egyptian province of Sharkijeh, and with wood, dates, and cotton. Rain falls but seldom, sometimes not once in three years. All around stretches a burning waste of sands. Suez owes its modern prosperity to the establishment of what is known as the *overland route* (q.v.) to India, in consequence of which a large portion of the traffic between England (and other European countries) and the east passes through the place; and to the opening of the Suez canal in 1869. For a long time previous to the establishment of the overland route, Suez had been in a state of complete decay, although, at a yet earlier period—previous, in fact, to the discovery of the sea-route to India by the cape of Good Hope—it was a flourishing emporium of the products of east and west. A salt manufactory has been established here by the Egyptian government, and sends every year very large exportations of its product to India.

The **GULF OF SUEZ** is the western and larger of the two branches into which the Red sea divides toward its northern extremity, and washes on the w. the coasts of Egypt, on the e. those of the Sinaitic peninsula. Extreme length, 200 m.; average breadth, about 20 miles. The shores are sometimes low, barren, and sandy wastes, sometimes bold and rocky headlands.

The **ISTHMUS OF SUEZ** is a neck of land 72 m. in width at its narrowest part, extending from the Gulf of Suez on the s. to the Mediterranean on the n., and connecting the continents of Asia and Africa. It embraces within its limits (according to the commonly received opinion) the fertile Goshen (q.v.) of antiquity; but it is now a wretched uninhabitable waste, consisting of mingled sand and sandstone, interrupted here and there with salt swamps or lakes, but almost entirely destitute of fresh water. The main interest that attached to this region, in recent times, was, whether or not—since Egypt was on the great highway to India and China—it was practicable to cut a ship-canal through the isthmus. We shall here briefly indicate the main steps that were taken to have this important question solved in a satisfactory manner.

It is certain that, in ancient times, a canal connecting (indirectly) the two seas did exist. At what period it was constructed is not so certain. Herodotus ascribes its projection and partial execution to Pharaoh Necho (about 600 years B.C.); Aristotle, Strabo, and Pliny less felicitously fix on the half-mythical Sesostris as its originator. The honor of its completion is assigned by some to Darius, king of Persia, by others to the Ptolemies. It began at about a mile and a half from Suez, and was carried in a north-westerly direction, through a remarkable series of natural depressions, to Bubastis, on the Pelusiac or eastern branch of the Nile. Its entire length was 92 m. (of which upward of 60 were cut by human labor) its width from 108 to 165 ft., and its depth 15 (Pliny says 30) feet. How long it continued to be used, we cannot tell; but at length it became choked up with sand, was restored by Trajan early in the 2d c. A.D., but again became unusable from the same cause, and so remained till the conquest of Egypt by Amrou, the Arab general of the Calif Omar, who caused it to be reopened, and named it the "Canal of the Prince of the Faithful," under which designation it continued to be employed for upward of a century, but was finally blocked up by the unconquerable sands, 767 A.D. In this condition it has ever since remained. The attention of Europe was first turned to it in modern times during the invasion of Egypt by Bonaparte, who caused the isthmus to be surveyed by a body of engineers, who arrived at the opinion that the level of the Mediterranean is 30 ft. below that of the Red Sea at Suez, an opinion

which a subsequent survey proved to be erroneous. From this time, the question continued to be agitated at intervals, especially by the French, and various plans were proposed, but nothing definite was arrived at till 1847, when France, England, and Austria sent out a commission to measure accurately the levels of the two seas. The commissioners, M. Talabot, Mr. Robert Stephenson, and Signor Nigrelli, ascertained that, instead of a difference of 30 ft., the two seas have *exactly the same mean level*. The only noticeable difference was, that there is a tide of $6\frac{1}{2}$ ft. at the one end and $1\frac{1}{2}$ ft. at the other. Another examination leading to similar results was made in 1853. Mr. Stephenson expressed himself very strongly against the feasibility of a canal, that is to say, a canal of such dimensions as would suit the requirements of modern commerce, and planned, instead, a railway from Cairo to Suez, which was opened (1858), and which now conveys overland all the Indian and Australian mails. The French, however, were not satisfied with Mr. Stephenson's conclusions, and M. Talabot, on his return to Europe, published in the *Revue des Deux Mondes* a plan for connecting the two seas by way of Alexandria and Suez (or rather a point 6 m. below Suez), for a description of which we have not space. In 1854 a new experimenter appeared in the person of M. de Lesseps, a member of the French diplomatic service in Egypt, who (1856) obtained from the pasha the "concession," i.e., the exclusive privilege of forming a ship-canal from Tyneh (near the ruins of ancient Pelusium) to Suez. The peculiarity of M. de Lesseps's plan lay in this, that, instead of following an oblique course, and uniting his canal with the Nile, as the ancients had done, and as all the modern engineers had thought of doing, he proposed to cut a canal right through the isthmus in a straight line to Suez. This canal was to have a minimum width at the surface of 262 ft., and at the bottom of 144 ft., with a depth of $22\frac{1}{2}$ ft.; and at each end there was to be a sluice-lock formed, 330 ft. long by 70 wide. By taking advantage of the tides at Suez, it was hoped that an additional depth of 3 or 4 ft. might be obtained. But the colossal feature of M. de Lesseps's plan was the artificial harbors which he proposed to execute at the two ends, Tyneh and Suez. That at the Mediterranean end was to be carried out 5 m. in order to obtain a permanent depth of water for a ship drawing 23 ft., on account of the enormous quantity of mud-sand which the Nile annually pours out (30,000,000 cubic yards, it is said), and which the prevalent wind drives eastward along the shore toward the southern coast of Palestine. The quantity of stone required to construct this harbor has been calculated variously at from 3 to 12 million cubic yards, and there are no stone quarries except at a great distance from Tyneh. The pier at Suez was to be carried out 3 m., and in other respects the difficulties, though great, were not, as on the Mediterranean coast, *almost insurmountable*. The English for political, perhaps, as well as for practical reasons, looked with aversion on M. de Lesseps's scheme; but in 1855, the question was again taken up in an international spirit, a new European commission was appointed, which reported that M. de Lesseps's scheme, somewhat modified, *was practicable*, and that a canal might profitably be constructed. The result of the report was the formation of a joint-stock company, with a subscribed capital of £8,000,000 (afterward increased), in which Saïd, the pasha of Egypt, took a large number of shares, and made large concessions of land; and the work was accordingly begun. The canal was to be dredged through lake Menzaleh, which runs far into the land directly toward Suez, to be connected with lake Temsah, the Bitter lake, and other marshy swamps, and so with Suez. Only a third of the way required to be excavated through the sands and rocks of the desert. As early as Dec., 1864, the Mediterranean and the Red sea had been connected. The communication, however, was not throughout by the permanent maritime canal, but simply by a fresh-water canal of no great width or depth. In April, 1865, the works, at the request of M. de Lesseps, were visited by another scientific commission, who reported more favorably of the scheme than was expected in England. They stated that the "construction of a ship-canal across the isthmus is only a question of time and money," and they added that three years would suffice for the completion of the various contracts connected with the undertaking.

The canal was formally opened in Nov., 1869. An account of the opening, and a description of the canal in its completed state, is given under SUEZ CANAL.

The hostility of the British nation to the canal faded away with its successful completion and the advantages which it afforded to British commerce. The fears expressed at the opening of the canal, that the trade of the east would be diverted from Great Britain as a center, were found by statistics to be groundless. In 1875 the British government purchased, for \$20,000,000, the Khedive of Egypt's shares in the canal, which amounted to 176,602 out of 400,000. These shares gave no returns to their owner till 1894, the Khedive having alienated the dividends till that period in favor of the company.

SUEZ CANAL. In the former article on this subject, the nature of the scheme was briefly described; and the progress of the works noticed down to the year 1865. In this place, some of the features will receive a little further explanation, now that the canal is finished and in operation. The canal is 100 m. long, 25 m. being through lakes.

The Port Saïd Entrance.—Port Saïd or Saïd, a t. now containing 10,000 inhabitants, had no existence in 1860. It became the depot of the company, the metropolis of vast bodies of laborers and other persons employed on the works of the canal. As the Mediterranean sea is very shallow near this point, an artificial deep channel had to be made,

bounded e. and w. by piers stretching far out into the sea. Stone for these piers was, in the first instance, brought from a long distance; but afterward artificial stone was made on the spot, consisting of two parts of sand and one part of hydraulic lime ground into a paste, and poured into wooden boxes or moulds. When the mixture solidified, the mould-boards were removed, and the solid blocks of artificial stone were left from three to six months in the open air to dry and harden. The blocks contain 10 cubic meters each, weigh 20 tons, and were made at a contract price of 42 francs per *mètre cube*. The western pier has a length of 7,000 ft., and the eastern of 6,000 ft.; they are 4,600 ft. apart at the shore, but gradually approach toward each other, so that their outer ends are only 2,300 ft. apart. The western pier is continued in an arc of 1100 yds. extent, so as, with the eastern pier, to shelter the harbor from all winds. Within this outer harbor is an inner port, 870 yds. by 500, which is kept at a uniform depth of 30 ft., by means of steam-dredging. The lighthouse, with its electric light, is 180 ft. high.

From Port Said to Temsah Lake.—From Port Said, the canal crosses about 20 m. of Menzaleh lake, a salt-water shallow, closely resembling the lagoons of Venice, having from 1 to 10 ft. depth of water. The canal through this lagoon is 112 yds. wide at the surface, 26 yds. at the bottom, and 26 ft. deep. An artificial bank rises 15 ft. on each side of this channel. Beyond Menzaleh lake, heavier works begin. The distance thence to Abu Ballah lake is 11 m., with a height of ground above the level of the sea varying from 15 to 30 ft. Crossing the last-named lake, there is another land distance of 11 m. to Temsah lake, cutting through ground to a depth varying from 30 to 70 or 80 ft.; and then 3 m. further across this little lake itself. At El Guisr, or Girsch, occurs the deepest cutting in the whole line, no less than 85 ft. below the surface; at the water-level it is 112 yds. wide, at the summit-level 173 yds., from which the vastness of the gap may be estimated. Ismailia (pop. 5,000) on Temsah lake, is regarded as the central point of the canal. While the canal was being made, it grew up rapidly from an Arab village to a French town, with the houses of engineers and managers, hotels, shops, cafés, a theater, and a central railway station, from which railways stretch to Alexandria and Suez.

The Fresh-water Canal.—This extends from the Nile to Temsah lake, and was constructed purposely to supply with water the population accumulating at various points on the line of the canal; but is also used by small sailing-vessels. This fresh-water or "sweet-water" canal comprises three portions or sections: (1) from the Nile e. or n.e. to Ismailia, on Temsah lake; (2) from Ismailia, nearly s. to Suez, on the western side of the great ship or maritime canal; (3) from Ismailia nearly n. to Port Said, also on the w. side of the ship canal. The first and second of these sections are really canals, large enough to accommodate small steamer and barge traffic; but the third section consists simply of a large iron pipe, through which the water is conveyed to the several stations. Plugs are inserted in the pipe wherever needed, to allow water to be drawn off for everyday wants.

From Temsah Lake to Suez.—The route crosses Temsah lake to Toussoum and the Serapeum cutting, through a plateau 46 ft. above the sea, where the waters were let in by the prince and princess of Wales, Feb. 28, 1869. There is a space of 8 m. from Temsah lake to the commencement of the Bitter lakes, which had to be dug to a depth varying from 30 to 62 ft., according to the undulations of the surface. In these deep cuttings, owing to the great width of the canal, the quantity of sand to be dug out (for it is nearly all sand, though sometimes agglomerated with clay) was enormous, requiring the constant labor of a large number of powerful dredging machines and elevators. In passing through the Bitter lakes, there was more embanking than excavating to be done, seeing that the bottom of this region is only two or three yards above the intended bottom of the great canal. From the southern end of the Bitter lakes to Suez, a distance of about 13 m., there is another series of heavy cuttings through the stony plateau of Chalouf, varying from 30 to 56 ft. in depth. Where cutting is thus difficult, the surface width is reduced considerably from the regular width of 327 feet. The canal is intended throughout to be 72 ft. wide at the bottom, and 26 ft. deep.

On Nov. 16, 1869, the Suez canal was opened in form, with a procession of English and foreign steamers, in presence of the Khedive, the empress of the French, the emperor of Austria, the crown-prince of Prussia, and others. On Nov. 27, the *Brazilian* went through; a ship of 1809 tons, 380 ft. long, 30 ft. broad, and drawing from 17½ to 20½ ft. of water. Since then, the canal has continued in successful operation, and passages have been made almost daily, chiefly by British vessels. The cost of construction of the canal was said to have reached in Dec. 1869, the total of \$58,135,000. In 1870, 491 ships, of 436,618 tons, passed through; and in 1895, 3434 ships, of 8,448,383 tons. The larger part of the shipping belongs to Great Britain. The great advantage of the canal is, of course, the shortening of the distance between Europe and India. From London or Hamburg to Bombay is by the cape about 11,220 m., but by Suez only 6332; that is, the voyage is shortened by 24 days. From Marseilles or Genoa there is a saving of 30 days; from Trieste, of 37. The rate at which steamers are allowed to pass through, is from 5 to 6 knots an hour. The canal charges are, 10 francs per ton, and 10 francs per head for passengers. The transit receipts for 1895 amounted to 78,426,000 francs. To secure uninterrupted sailing, enlargement of the canal was begun in 1884; an additional breadth of 262 feet, it was believed, would increase the speed of vessels to 8½ knots an hour.

SUFFIELD, a town in Hartford co. Conn.; on the Connecticut river and the New York, New Haven and Hartford railroad; 17 miles n. of Springfield. It was incorporated in 1674 by Massachusetts, and annexed to Connecticut in 1749. The principal industries are farming, tobacco growing, and cigar making. It has a public library, literary institute, water works supplied from artesian wells, national and savings banks, and several churches. The assessed property valuations exceed \$2,000,000. Pop. '90, 3169.

SUFFOCATION. See ASPHYXIA and RESPIRATION.

SUFFOLK, a co. in e. Mass., on Massachusetts bay, containing the cities of Boston and Chelsea, the townships of Revere and Winthrop, and some small islands in Boston harbor and Massachusetts bay; 45 sq. m.; pop. '90, 484,780. Co. seat, Boston.

SUFFOLK, a co. in s.e. New York, bounded on the n. by Long Island sound, on the s. by the Atlantic ocean, watered by the Peconic and other rivers, traversed by branches of the Long Island railroad; area, 720 sq.m.; pop. '90, 62,491, chiefly of American birth. It includes the central and e. portions of Long Island. The surface is level except in the north. Co. seat, Riverhead.

SUFFOLK, a maritime co. of England, bounded on the e. by the German ocean, on the n. by Norfolk, and on the s. by Essex. Area, 947,681 acres; pop. '91, 371,235. The surface is for the most part flat, falling away into marshes on the n.w. and n.e. borders. The coast-line, which is low and marshy, or lined with cliffs of shingle or gravel and red loam, is about 50 m. in length, and is, on the whole, regular, being unbroken by any considerable indentation, and comprising no headland worthy of notice except Lowestoft Ness, the most easterly point in Great Britain. The tributaries of the Waveney, which separate Suffolk from Norfolk on the n., and those of the Stour, which form the boundary-line on the s., together with the river Lark, an affluent of the Great Ouse, and the Gipping, which, after it begins to broaden into an estuary, is called the Orwell, are the chief streams. The climate is cold in spring, but is drier than that of the western counties. The soil is of various kinds, some of which are very productive. Most of the land is under cultivation, and the most improved system of agriculture has been introduced, together with the best and newest agricultural implements. A polled breed of cattle, of which the cows are deservedly held in high esteem, is peculiar to the county. The Suffolk pigs are a famous and most profitable breed. The ordinary crops are raised. The co. is divided into six parliamentary districts. Capital, Bury St. Edmunds.

SUFFRAGAN (Lat. *suffraganeus*, from *suffragium*, a suffrage or vote), the name given to a bishop in a province, in his relation of dependence or subordination to the archbishop, or rather metropolitan, of the province. See METROPOLITAN. In some continental churches, the name is applied to coadjutor-bishops appointed—as in the case of prince-bishops in the German empire—to assist the bishop in his own diocese.

SUFFRAGE (Lat. *suffragium*, derivation uncertain), a right to vote, and more particularly the right possessed by the citizen of a state where representative government exists to vote for a member of the legislative body.

The idea that the universal enjoyment of political suffrage is a right by natural law is grounded on the fiction that the obligations of municipal law arise out of a social contract express or implied. In opposition to this notion it is argued that the true purpose for which government exists is the general welfare of the nation; and it is the duty of state to consider whether the suffrage may be more beneficially exercised by the many or the few. Infants, minors, idiots, and insane persons have everywhere been excluded from the suffrage, on the ground that sound judgment is necessary for its exercise. Persons convicted of crimes have been excluded, as a security to society; and also almost universally women, for reasons based on their relation to society and to the opposite sex. Like considerations of expediency, it is argued, are a ground for withholding the suffrage from those whose circumstances and station in life render it unlikely that they should form a sound judgment on political questions. It is the intelligence and enlightenment of the country that an elective legislature should represent; and in any large extension of the suffrage there is obviously a risk of the intelligence of a constituency being swamped by its mere numerical majority. A widely extended suffrage has, however, been advocated as a valuable means of educating the people to self-dependence; and several philosophical politicians of the present day, who are favorable to a large extension of the electoral qualification, propose to obviate what they regard as its otherwise inevitable evils by graduating the suffrage, so as to give each individual elector a number of votes corresponding as much as possible to his property, education, or social position. Schemes for this end, differing in detail, have been proposed by Mr. J. Stuart Mill, in his *Considerations on Representative Government* (1851); and by Prof. Lorimer in his *Political Progress not necessarily Democratic* (1857), and *Constitutionalism of the Future* (1865). See REFORM, REPRESENTATION, BALLOT.

Suffrage, under the United States constitution, is exercised by such electors in each state as have the qualifications necessary for electors of the most numerous branch

of the state legislature (art. 1, sec. 2). By the XIV. and XV. amendments the states are forbidden to abridge the privileges or immunities of United States citizens (see PRIVILEGES AND IMMUNITIES), or to deny or abridge the right of suffrage on account of "race, color, or previous condition of servitude." It seems clear that the states retain the right to impose conditions on suffrage other than those specifically prohibited in the amendments. The age of 21 is universally fixed on as that when suffrage may be exercised by male citizens; conviction for crime, insanity, and pauperism everywhere excludes. In a few states ability to read and write is required, while Rhode Island has a small property qualification. Wyoming territory, 1885-87, allowed women to vote in local matters, and Massachusetts in 1879 passed a law allowing women to take part in the town election of school officers; some other states have similar provisions.

SUFISM (from *sufi* or *sofi*, the Greek *sophos*, a sage; erroneously also derived from Arab. *sof* or *suf*, wool, and thus designating an individual who wears nothing but woolen garments) designates a certain mystic system of philosophical theology within Islam. Its devotees form a kind of ecclesiastical order somewhat similar to that of the fakirs (q. v.), or dervishes, but they are mostly of a far superior stamp; and some of the greatest Persian poets, philosophers, historians, and even kings belonged to their ranks. They assume four principal degrees of human perfection or sanctity. The first or lowest is that of the shariat—i. e., of the strict obedience to all the ritual laws of Mohammedanism, such as prayer, fasting, pilgrimage, almsgiving, ablutions, etc., and the ethical precepts of honesty, love of truth, and the like. The second degree (*tarik*) is not attainable by all, but only by those higher minds that, while strictly adhering to the outward or ceremonial injunctions of religion, rise to an inward perception of the mental power and virtue necessary for the nearer approach to the divinity, the necessity of, and the yearning for, which they feel. The third (*hakikal* = truth) is the degree of those who, by continuous contemplation and inner devotion, have risen to the true perception of the nature of the visible and the invisible—who, in fact, have recognized the Godhead, and through this knowledge of it have succeeded in establishing an ecstatic relation to it. This state is finally sublimated into that highest and last degree (*maarifal*), in which man communicates directly with the Deity. Practically, the great mass of the people take the lowest degree; the second stage is reached by the "*murides*," who do not fulfill the behests of the ceremonial law because they are behests, but because they are good in themselves, knowing that virtue is good; and because it leads to truth, they adhere to it for its own sake. They give alms because the sight of poverty grieves them; their ablutions are as much due to their desire of physical purity as to that of obeying a religious injunction. The third stage is that of the *naibs*, to whom all this spiritualizing of faith applies in a still more eminent degree. And the highest stage of attainable perfection is that of the *murshid*, whose words are God's words, pure and simple, because he is in direct and constant communion with God. He is the "*sun of faith*," by whose reflected light shine the *naibs*, its "*moons*." All Sufistic poetry and parlance is to be taken allegorically and symbolically. They represent the highest things by human emblems and human passions; and religion being with them identical with love, erotic terminology is chiefly used to illustrate the relation of man to God. Thus the beloved one's curls indicate the mysteries of the Deity; sensuous pleasures and chiefly intoxication, indicate the highest degree of divine love as ecstatic contemplation; while the wine-house, of which constant mention is made, merely indicates the state in consequence of which our human qualities merge in or are exalted into those of the Deity. Founded in the 9th c. by Kafi-Mullah, this peculiar mysticism has principally struck root in Persia, and chiefly among men of genius, e. g., Hafiz (q. v.). Recently, it has been revived, with slight modifications, by Shamil, the renowned and once formidable antagonist of the Russians, who undertook to enlist even the common soldiers, if not in the ranks of the initiated—for Sufism, in its real meaning, is very exclusive—at least of its votaries; and the very lowest among them even had a sentence given him indicative of his forming part of the sect and of the gradations that form its main characteristic. In conclusion, it may be observed that Sufism mixes up all religions and all their prophets indiscriminately in one class; and the words idolatry, unbelief, licentiousness, and the like are generally used in their reverse sense by its votaries. Their principal religious writer is Jaleddin Rumi.

SUGAR (Lat. and Gr. *sacchar*-, Sans. *sarkara*, Pers. *schakar*, Arab. *sokkar* or *assokkar*, Sp. *azucar*, It. *zucchero*, Fr. *sucre*, Ger. *zucker*) is a general term applied by chemists to a number of neutral carbo-hydrates, possessing a more or less sweet taste, for the most part crystallizable, and produced by the vital processes going on in certain plants and animals. They are divisible into two groups, the first embracing such sugars as are capable of undergoing fermentation, and of being resolved, under the action of yeast, either directly or indirectly into alcohol and carbonic acid gas; and the second including those sugars which are not capable of being broken up by fermentation into the above-named products. The first group contains cane-sugar or sucrose, fructose or inverted sugar, trehalose, mycose, melezitose, melitose, grape-sugar or glucose (q. v.), and milk-sugar or lactose; while the second group includes inosite or inosin, sorbite or sorbin, scyllite or scyllin, and eucalyn.

Cane-sugar or *sucrose*, $C_{12}H_{22}O_{11}$, the ordinary sugar of commerce, is by far the most

important of this class of compounds; and in so far as its sweetening properties are concerned, it exceeds grape-sugar in the ratio of 5 to 2, and milk-sugar in a still higher ratio. It has a specific gravity of 1.6. It dissolves in about one-third of its own weight of cold water, producing a thick viscid syrup, and in all proportions in hot water; it is slightly soluble in absolute alcohol, but spirit of wine of specific gravity 0.830 dissolves about one-fourth of its weight. By the spontaneous evaporation of its watery solution it is deposited in four-sided rhomboidal prisms. Common loaf-sugar and sugar-candy are two well-known forms of crystallized sugar; the former consisting of a mass of small transparent crystals, and owing its dazzling whiteness to the numerous reflections and refractions which the rays of light undergo within the interior from the numberless crystals of which it is composed; while the brown color which the latter usually possesses is due to the coloring matter not having been removed from the syrup previous to crystallization. The crystals of sugar-candy are larger than those of loaf-sugar, in consequence of the slower evaporation in the former case. When crystals of sugar—as, for example, two pieces of loaf-sugar—are rubbed together in the dark, a pale phosphorescent light is evolved. If a solution of sugar be boiled for a long time it acquires an acid reaction and loses its power of crystallizing—a change which is attended by the assimilation of additional water, and the formation of the uncrystallizable inverted sugar which will be presently described. If the boiling be further prolonged the inverted sugar, $C_6H_{12}O_6$, assimilates more water, and is converted into grape-sugar, $C_6H_{12}O_6 + 2Aq$, while a little formic acid and ulmin (a brown, nearly insoluble substance belonging to the *humus* group) are produced. The crystallization of sugar is also prevented by the addition of a little oxalic, citric, malic, or any of the stronger acids to its solution; and in order to check the bad effects of an acid, a small quantity of lime is usually added to the cane-juice before it is heated.

The action of different degrees of heat on sugar has been carefully studied. At about $320^\circ F.$ ($160^\circ C.$) sucrose fuses, and on cooling forms the transparent amber-colored solid known as *barley-sugar*, which, if kept for a long time, assumes a crystalline state, and becomes opaque. If the application of heat be continued until about $410^\circ F.$ ($210^\circ C.$), the sugar loses two atoms of water, and *caramel*, which is described in the article *GLUCOSE*, is formed, and at a still higher temperature, the changes which sucrose undergoes are identical with those suffered by glucose. Sugar dissolves many metallic oxides when its solution is boiled with them—as, for example, freshly precipitated oxide of lead, lime, and baryta, and its presence prevents the precipitation by alkalies of several of the metallic oxides from their salts—the oxides of copper and of iron being thus retained in solution. Many metallic oxides are partially or entirely reduced when boiled with sugar; thus chromic acid is reduced to sesquioxide of chromium, salts of the red oxide of mercury are converted into those of the suboxide, and salts of gold give a precipitate of the reduced metal. It does not reduce alkaline solutions of oxide of copper to the suboxide (Trommer's test) unless with the aid of heat, which converts it into glucose. Under the action of certain oxidizing agents it may be converted into propionic, formic, and acetic acids. Sucrose is not *directly* capable of undergoing fermentation; but in the presence of a ferment (yeast, for example) it is converted into glucose, and in that form it readily undergoes vinous, lactic, and butyric fermentation. Its action on polarized light is described below.

This variety of sugar is chiefly obtained from the juice of the sugar-cane, but it is also abundantly present in the juices of certain species of maple and of beet-root, all of which yield this substance as a commercial product; it is also contained in sugar-grass (*sorghum saccharatum*), whose juice yields 13 per cent of sugar; in carrots and turnips, in the pumpkin, the chestnut, the young shoots of maize, in the flowering buds of the cocos palm, and in a large number of tropical fruits. Its use as an article of diet has been already mentioned under *Diet*. Several articles of food contain some form of sugar in considerable quantity. In peas, there are 2 per cent of sugar; in rye-meal and wheaten bread, about $3\frac{1}{2}$ per cent; in cows' milk, $4\frac{1}{2}$ per cent; in goats' milk and in barley-meal, $5\frac{1}{2}$ per cent; in human milk, in asses' milk, ripe gooseberries, and ripe pears, about 6 per cent; in oatmeal, about 8 per cent; in wheaten flour, from 4 to 8 per cent; in beet-root, from 5 to 10 per cent; in ripe peaches, $16\frac{1}{2}$ per cent; in ripe cherries, 18 per cent; and in dried figs, upwards of 60 per cent. Although sugar is commonly regarded as a luxury, it is in reality a very valuable article of food (as, indeed, might be inferred from its presence in milk, and in both the yolk and white of eggs), since it is very rapidly digested, and supplies heat-forming or respiratory food to the system, "When, however," says Dr. E. Smith, "it is compared with wheaten flour, it is a very dear food, since three or four times more carbon will be obtained for 1d. in flour, besides nitrogen, none of which is found in sugar. It has also been proved by Messrs. Lawes and Gilbert that even its fattening properties—that is to say, its power to form fat in the system, when it is supplied in excess of the quantity which the daily wants of the body require to produce heat—are not greater than those of starch as found in the cheapest grain."—*Practical Dietery*, 1863, p. 63. In consequence of sugar being a fat-forming substance, it should be taken very sparingly in cases of excessive obesity. There are certain forms of dyspepsia in which sugar should be avoided, as exciting increased gastric uneasiness; and in diabetes, all articles of food containing or (like starch) yielding sugar, should be rigidly prohibited. Although prone to fermentation when in a

dilute state, in its concentrated form sugar possesses great antiseptic power, and is extensively employed to preserve both vegetable and animal substances from decay. The sugar naturally existing in some fruits is often sufficient to insure their preservation in a dry state, while in other cases it is added, as in preserves and jellies. A mixture of salt and sugar applied to meat, fish, etc., preserves more of the natural flavor than mere salting does. Sugar converted into caramel is much used by cooks and confectioners as a coloring matter.

Closely allied in their chemical characters to sucrose are the following comparatively rare forms of sugar: (1) *Trehalose*, $C_{12}H_{22}O_{11} + 2H_2O$, so called from *Trehala*, or Turkish manna (the product of a coleopterous insect, *Larinus nidificans*), from which this variety of sugar is extracted, differs from sucrose in the following points—it crystallizes in brilliant rectangular octahedra; contains water of crystallization; fuses at 212° F. (100° C.), and loses its water of crystallization; is very soluble in hot alcohol; possesses about three times as great a rotatory power on polarized light; and when heated to 256° F. (130° C.), it loses its water of crystallization. (2) *Mycose*, obtained from ergot of rye, possesses the same composition as trehalose, from which it mainly differs in crystallizing in rhombic prisms, and in exhibiting a somewhat weaker rotatory power. (3) *Melcitose*, $C_{12}H_{22}O_{11} + H_2O$, obtained from larch manna, differs from cane-sugar in its less sweet taste, and in exhibiting a less powerful rotatory action. (4) *Melitose*, $C_{12}H_{22}O_{11} + 3H_2O$, the chief ingredient in the Australian manna yielded by the *eucalyptus* tree, crystallizes in acicular prisms, is feebly sweet, undergoes fermentation with yeast; but yields only half as much alcohol and carbonic acid as would be obtained from an equal weight of glucose, one half of this sugar being converted into an unfermentable syrupy body, known as *eucalym*, $C_6H_{12}O_6$.

More important than any of the above varieties, and differing from cane-sugar in a distinctive physical property, is the substance formerly known as *fruit sugar*, but now often described as *inverted cane-sugar*. The objection to the former name is, that the sugar contained in many ripe acidulous fruits, and formerly regarded as a distinct variety, is merely a mixture of cane-sugar, with more or less of the *inverted sugar*, $C_6H_{12}O_6$, which has already been noticed as resulting from the action of prolonged boiling, or of a little acid on cane-sugar. The same change occurs in many ripening fruits, in consequence of the presence of a peculiar albuminous ferment. Inverted sugar is not crystallizable, is soluble in dilute alcohol, and produces *left handed* rotation; hence its name. By chemical means, it is convertible into grape-sugar, a change which sometimes occurs spontaneously, as is seen in the gradual crystallization of the sugar in dried fruits.

Grape-sugar, constituting the hard granular sweet masses occurring in old dried fruits, such as raisins, figs, etc., has already been described in the article GLUCOSE, or GLUCOSE, under which names it is commonly known to chemists. It is also known as *starch-sugar*, because it is readily obtained by the action of a dilute acid on a hot solution of starch, and is identical with the sugar occurring in the urine in diabetes.

Milk-sugar, known also as *lactine* and *lactose*, $C_{12}H_{22}O_{11}$, or, according to some chemists, $C_{12}H_{22}O_{11} + H_2O$, is a purely animal product. It exists in considerable quantity in the milk, especially of the herbivorous animals, and is one of the most important and essential ingredients in that secretion. It may be obtained on a large scale by separating the curd from the milk, and evaporating the whey till it is ready to crystallize; when, on the introduction of small pieces of wood, the crystals of sugar are deposited on them. These crystals are four-sided prisms of a milk-white color, and so hard that they crunch between the teeth. This variety of sugar is only moderately sweet (*vide supra*), requires about six times its weight of cold water for its solution, but dissolves readily in boiling water, while it is insoluble in alcohol or ether. If it be gradually heated to 284° F. (140° C.), two equivalents of water are expelled, whereas, if it be suddenly heated to about 400° F. (204.5° C.), all five equivalents are given off. When pure, milk-sugar is insusceptible of fermentation; but when boiled with dilute acids, it is converted into a directly fermentable sugar, in many respects very similar to grape-sugar, and to which some chemists have given the name of *lactose*, a term commonly applied to milk-sugar itself. On treating a moderately diluted acid solution of milk-sugar with yeast, this variety is first formed, and then yields carbonic acid and alcohol; if, however, decomposing matters, as, for example, casein in the act of disintegration, are present, it undergoes lactic and butyric fermentation; and hence we understand how milk after exposure for a time to the air becomes sour. The intoxicating character of the drink prepared by the Kalmucks and Tartars from sour mares' milk, is due to this indirected vinous fermentation of sugar of milk. Regarding the uses of this variety of sugar, it may be observed that it is probably the most important of the constituents of whey (which is milk deprived of the whole of its casein except a mere trace held in solution), and hence that it is the active ingredient in the *whey-cure*, which is so popular in Switzerland. (The whey in these cases is usually obtained from goats' milk.) It is also the chief constituent of the globules used in homeopathy.

The second group of sugars, namely, those which are incapable either directly or indirectly of undergoing fermentation, are of less practical importance than cane sugar, grape-sugar, or milk-sugar.

Inosin, or *inosite* (derived from the Greek *is*, gen. *inos*, muscle), is represented by the

formula $C_6H_{12}O_6 + 2H_2O$. It occurs as a normal constituent in the juice of the heart, and of the involuntary or unstriated muscles, and has also been found in the tissues of the lungs, spleen, liver, kidneys, and brain, and in the urine in Bright's disease and diabetes. It has been recently shown that it is identical with the substance previously known as *phaseo-mannite*, which is readily obtained from the unripe seeds of the common kidney-bean (*phaseolus vulgaris*). It forms colorless efflorescent prisms, which lose two equivalents of water at about $212^\circ F.$ ($100^\circ C.$). When mixed with decaying cheese and chalk, it becomes gradually converted into lactic and butyric acids. *Seyllite* is a saccharine matter closely resembling inosite, and occurring in various organs of several plagiostomous fishes, and especially in the kidneys of the rays and skate. It differs, however, from inosite in its crystalline form, and in its containing no water of crystallization. Its composition is unknown. *Sorbin*, or *sorbite*, $C_6H_{12}O_6$, derives its name from its occurring in the juice of the berries of *sorbus aucuparia*, the service tree, and may be obtained in colorless transparent rhombic octahedra. It reduces oxide of copper to the suboxide (Trommer's test), and is of a sweetish taste.

Closely allied to the sugars, but differing from them in their chemical composition (inasmuch as they do not contain hydrogen and oxygen in the proportions to form water), are *mannite*, $C_6H_{14}O_6$, obtained from *manna*, the inspissated juice of the *fraxinus ornus*, but also occurring in celery, onions, asparagus shoots, *laminaria saccharata* and other sea-weeds, certain fungi, the juice which exudes from apple and pear trees; *dulcite*, $C_6H_{14}O_6$, the product of an unknown Madagascar tree; *quercite*, $C_6H_{12}O_6$, obtained from acorns; and *pinite*, $C_6H_{12}O_6$, from *pinus lambertiana*, a tree growing in Australia and California. All these bodies are crystalline, and sweet to the taste.

Although chemists have hitherto looked upon the sugars as organic compounds, without any recognizable radical, and from their composition have termed them *carbohydrates*, "the researches of Berthelot render it probable that the sugars as well as mannite, and the bodies allied to it, are polyatomic alcohols, like glycerine, for he has found that they possess the power of entering into combination with various acids, with elimination of water, in some cases yielding colligated acids analogous to the tannic, and in others furnishing neutral bodies, closely allied to the fats." Miller's *Organic Chemistry*, 2d ed. p. 72.

Among the various chemical purposes to which the phenomenon of circular polarization may be applied, we may especially mention its use in determining the quantity of any kind of sugar in solution. While some sugars give a right-handed rotation, others give a left-handed rotation, and each sugar exerts a definite amount of rotatory power. The following are the rotatory powers of the chief varieties of sugar, equal weights of each being dissolved in an equal bulk of water, and the temperature being $59^\circ F.$ ($15^\circ C.$):

| | | | |
|----------------|----------------------------|-------|--------------|
| Cane-sugar | $C_{12}H_{22}O_{11}$ | right | 73.2° |
| Milk-sugar | $C_{12}H_{22}O_{11}$ | " | 58.3° |
| Melezitoze | $C_{12}H_{22}O_{11}$ | " | 94.1° |
| Melitose | $C_{12}H_{22}O_{11}$ | " | 102° |
| Trehalose | $C_{12}H_{22}O_{11}$ | " | 220° |
| Grape-sugar | $C_6H_{12}O_6$ | " | 57.4° |
| Inverted sugar | $C_6H_{12}O_6$ | left | 26.7° |
| Sorbin | $C_6H_{12}O_6$ | " | 46.9° |

For details regarding the apparatus to be employed, and the method of using it, we may refer to Miller's *Chemical Physics*, 3d ed. p. 204; and to a memoir by Clerget in the *Ann. de Chimie*, iii., xxvi. 175. This method has been applied to determine the amount of sugar in diabetic urine, to ascertain the quantity of sugar which remains in the unfermented state in wines, and to other similar purposes. As, however, the process is one of extreme delicacy, this method must be used with great caution.

Manufacture.—The manufacture of sugar from the sugar-cane and other sources is now one of the largest branches of human industry, but this great development is of comparatively recent date; and although there are evidences of its very high antiquity in India and China, sugar appears only to have been vaguely known to the Greeks and Romans. It is mentioned by Theophrastus as "honey in reeds;" and Lucan has the following line, which indicates a knowledge of its existence, but merely as a curious fact:

Quique bibunt tenera dulces ab arundine succos.

Its introduction to Europe appears to have been one of the results of the Crusades. The sugar-cane was grown in Cyprus about the middle of the 12th c.; it was from thence, at a later time, transplanted to Madeira, and at the commencement of the 16th c., was carried from the latter island to the West Indies. Originally, in all probability, only the sweet recent juice was known; for apparently the art of boiling it down, and forming it into raw sugar, was an invention of the 15th c.; and it was not until the middle of the following century that a Venetian discovered the art of refining sugar, which soon became established in Germany. The first refinery of which any notice exists was one in Dresden, as early as 1597; but long previous to this the subject had attracted so much attention as to be discussed in learned treatises, one of which in particular, the *Saccharologia* of Sala, in the beginning of the 16th c., shows that the clarification of the syrup by defecation was then a matter of some importance. Still, the manufacture of sugar in the

countries to which it had been introduced made but slow progress, for its use was limited by its dearness to the wealthy. The material has now, however, become one of the commonest necessities of life, and has largely conduced to the health of nations. Until 1747, sugar was supposed to be the product of the sugar-cane only, but in that year, Marggraf, a German chemist, demonstrated that it was a natural product of other vegetables, and especially of the beet-root; and half a century later, its manufacture from that source was first commenced in Silesia. A large portion of the sugar consumed on the continent is now obtained from this source. See BEET-ROOT SUGAR.

Since we have become better acquainted with the sources of sugar supplies, we have learned that a large portion of the raw sugar of the East Indies received in British ports as cane-sugar is in reality made from the juice of several palms, especially that of *arenga saccharifera*, and the wild date, *phoenix sylvestris*. The juice is obtained from these plants by cutting off the male spadix when young, and from the cut portion there is for four or five months a continual flow. The liquid is at first clear, and is immediately boiled down to a thick syrup, which granulates on cooling, and constitutes, if not otherwise purified, the coarse brown sugar called jaggery, which is extensively consumed in India. More carefully prepared, it is sent to Europe with sugar made in the cane-plantations, and is only distinguished from it by well-skilled persons. If the juice is not immediately boiled, it becomes turbid, and passing into the vinous fermentation, forms the intoxicating drink called toddy.

In Canada and in the United States very much sugar is made by boiling the juice or sap of the sugar maple-tree (*acer saccharinum*). The *sorghum saccharatum*, or sugar-grass (see DURRA), and the stalks of ordinary maize or Indian corn (*zea*) yield sugar, which has lately been made so as fairly to rival the best crystallized cane-sugar (see under SUGAR-CANE).

Beet-root sugar is manufactured from the fresh-dug roots, chiefly of the varieties we call mangold-wurzel. The process (which, however, is constantly undergoing modifications) is briefly described in the article BEET-ROOT SUGAR. Beet-root yields from 7 to 8 per cent of sugar, of which only 3 to 4 per cent are of the best quality, called *melis*, 2 to 3 per cent of the second quality, called *farin*, and the remainder molasses.

The manufacture of starch-sugar is described in the article GLUCOSE.

From the beginning of the 16th c., when the sugar-cane of India was introduced to the West Indies, sugar has been one of the most important products of those islands. Careful cultivation has produced many varieties of this useful plant, some of which are better adapted than others for particular localities. The original variety introduced into the West Indies is still cultivated under the name of the *Creole cane*; but the favorite variety is the *Otaheite cane*, which is the most luxuriant grower, and gives the largest yield of juice. It is the variety chiefly cultivated in Brazil, Demerara, and Venezuela, as well as the West Indies. In many parts of the east, another admirable variety is the *Batavian or striped cane*; it was originally raised in Java, and is the favorite with rum-distillers.

The extraction of juice from the sugar-cane is effected by simple pressure. In its native country, India, there are still in use in some districts machines of the rudest construction, which are probably the same which were used a thousand years since. The Chinapatam sugar-mill consists of a mortar made by cutting down some hard-wood tree to within 2 or 3 ft. of the ground, and hollowing the top of the portion left standing in the ground into the form of a mortar. A small hole is then bored obliquely through from the bottom of the cavity to the outside, and a pipe conveys the juice into a jar. A cylindrical piece of wood, sharpened at each end, acts as a pestle, and is kept in its place with sufficient pressure by a lever and ropes. Two men are required: one has a basket supplied with small lengths of freshly-cut cane, which he places, 2 or 3 at a time, in the mortar, and, when necessary, removes the crushed ones; the other man sits on the other end of the train, balancing it, and at the same time drives oxen which are attached to the end of the beam, and keeps the movable parts of the mill constantly turning round. Notwithstanding the rudeness of this contrivance, very large quantities of sugar are made by it in India. A much better one, however, is the Chica Ballapura engine, which consists of two upright rollers, the heads of which are formed into double spiral screws, which work in one another, so that when an ox is yoked to the long curved lever and goes round, one of the upright rollers, being connected with the lever, is made to revolve, and its screw carries the other one round, but in an opposite direction. The pieces of cane are fed in by hand between the rollers, and as the juice is squeezed out, it flows down into a small hollow below the frame made to receive it, whence a small trough carries it to an earthen pot. The frame of this mill is securely fixed with stakes driven deep into the ground. In all probability, this very ancient machine has been the origin of all the most modern ones, for they all consist of rollers placed either vertically or horizontally, between which the canes are made to pass.

The mills now in general use for squeezing the juice out of the sugar-canes are very powerful machines. Some idea of the strength of those mills will be formed from the fact, that one of the rollers weighs upward of 5 tons. The axles are 12 in. in diameter, and notwithstanding that they are made of the best wrought iron, they are not secure against breakage. The manufacture of sugar has probably been carried to greater perfection in the islands of Java, Mauritius, and Cuba, than in any other parts

of the world. In Java especially, in consequence of the great extent of the plantations, the planters have been able to erect very complete establishments for the manufacture of sugar.

The following very condensed account of the process of making sugar in Java will give some idea of the operation.

The canes, freed from all loose leaves, are passed through between the rollers under the greatest possible pressure that can be brought to bear upon them. The rollers revolve only from two to four times per minute. From 100 lbs. of canes, 65 to 75 lbs. of cane-juice will be expressed. This juice, which is of a sweetish taste, and of the color of dirty water, passes direct from the mill to a small reservoir, where it usually receives a small dose of quicklime, and without delay runs off to large iron or copper vessels, heated either by a fire underneath or by steam-pipes in the liquid. As the temperature of the juice rises, a thick scum comes to the top, which is either removed by skimming, or the warm juice is drawn off from below the scum. The concentration of the juice is partly effected in a series of large open hemispherical iron pans about six to eight ft. diameter, of which five or six are placed in a row, with a large fire under the one at the end. This one fire, which runs along under the whole row of pans, is found sufficient to make two or three of them nearest the fire boil violently, and in addition, it warms the juice in the pans furthest from the fire. As the juice first enters the pans furthest from the fire, it gets gradually heated, and the vegetable impurities rise in scum to the top, and are carefully removed. As the juice is ladled from one pan to the next, it boils with greater and greater vigor as it approaches nearer the fire, until in the pan immediately over the fire it seethes and foams with excessive violence; and this seems to be essential to the successful making of sugar. It is known that the presence of all those impurities which constitute the scum interferes with the crystallizing of the sugar; and the rapid ascent of bubbles of steam through the liquid in the pans carries all impurities dispersed through the body of the liquid to the top, where they can be removed with facility. It is well known that great heat is very destructive to cane-juice; that is to say, it turns much of the crystallizable sugar into treacle or uncrystallizable sugar, but the gain arising from getting rid of much of the impurity in the cane-juice more than compensates for the destruction of part of the sugar. After the concentration has been carried to a given point, and all the scum has been got rid of, the application of a high heat, which would act with an increasingly destructive effect as the condensation became greater, is suspended, and the liquor, now of the color of turbid port wine, and of the consistency of oil, is drawn into the vacuum-pan, where the concentration is completed at the lowest possible temperature, generally about 150° Fahr. The vacuum-pan is in universal use in all European sugar-refineries, and in all well-provided sugar-plantations. It is generally made of copper, of a spherical form, and from six to nine feet diameter. The bottom is double, leaving a space of an inch or two for the admission of steam between the two bottoms, and there is generally a long coiled copper pipe of three or four inches diameter above the inner bottom, so as to still further increase the amount of heating surface. This apparatus is made perfectly air and steam tight. Leading from its upper dome, there is a large pipe, communicating with a condenser into which a rush of cold water is continually passing, so as to condense all the steam or vapor that arises from the liquid boiling in the vacuum-pan. The water which is constantly rushing into the condenser is as steadily withdrawn again by pump. There is thus a constant vacuum in the pan, and, consequently, the liquid in it will boil at a much lower temperature than it would in an open pan or boiler. There is an extraordinary advantage in being able to effect the latter stages of concentration at a low temperature, for it is when the liquid becomes thick that the destructive results of a high temperature become most excessive.

As the concentration of the liquid in the vacuum-pan proceeds, crystals of sugar begin to form, and the skill of the sugar-boiler is shown by the uniformity of the crystals he produces. The boiling is commenced by filling in only about a third or fourth of the quantity the vacuum-pan will hold, and gradually adding more liquid as the crystals increase in size. The sugar-boiler is able to watch the changes going on in the vacuum-pan by means of small samples he withdraws from it by means of a suitable apparatus. The sugar-boiler holds those drops of thick fluid on his finger and thumb, between his eye and a strong light, and is thus able to detect those minute changes in its condition which show that it is time to add an additional quantity. By the time the vacuum pan is full, the contents have thickened, by the formation of crystals of sugar, into a mass of the consistency of thick gruel; it is then allowed to descend into a vessel called the heater, where it is simply kept warm until it can be run out into the "forms," which, in the sugar-growing colonies, are generally conical earthen pots, holding from one to two cwt. of sugar. It is allowed to cool and complete its crystallization before the plugs, which close the bottom of the pots, are withdrawn. When this is done, from one-fourth to one-third of the contents of the forms, which has remained in a fluid state, runs off into gutters leading to large tanks, from which it is again pumped up into the vacuum-pan, and reboiled, yielding a second quality of sugar. This reboiling of the drainings is repeated, with a continually decreasing result, both as to quantity and quality of the solid sugar obtained, and it is rarely carried beyond the fourth boiling. If the planter wishes to obtain Muscovada or unclayed sugar, the process is now complete, and the sugar is turned out of the forms, and packed for shipment. In some cases, the sugar is

run direct from the vacuum-pan into casks or hogsheads, which replace the forms, holes being bored in the bottoms of the casks, to admit of the uncrystallized portion of the sugar draining out.

If *clayed* sugar is to be made, the forms are allowed to stand for a few days until all the treacle has drained out; and a quantity of thin mud, about the consistency of good thick cream, is then poured over the sugar to the depth of one or two inches. The water contained in this thin mud slowly steals down through the sugar, and mixing with the coatings of treacle still adhering to the outsides of the crystals of sugar, renders them less viscid, and facilitates their descent to the bottom of the form. The mud remains, at the end of a few days, in the form of a dry hard cake on the top of the sugar, and none mixes with the sugar.

The process of claying sugar is simply washing off a coating of black or yellow treacle from a crystal of sugar, which is always white. This operation is possible without dissolving the crystal of sugar, simply because the treacle has a greater affinity for water than the crystallized sugar has. Anything that would yield a very slow and steady supply of water to the sugar, would do as well as mud or clay. There is always some loss of crystallized sugar in the process of claying, and attempts have been made to use strong alcohol for washing off the coatings of treacle from the crystals; but although alcohol dissolves treacle very freely, and scarcely acts on the crystals at all, still it has not been found to answer commercially. Besides the cost of the process, there is a difficulty in getting rid of the smell of alcohol in the sugar.

The centrifugal machine of Messrs. Manlove, Alliott & Co. has been very extensively used for getting rid of the treacle. Its action depends on precisely the same principle as that called into play when a sailor twirls a mop to expel the water from it. The centrifugal machine is simply a drum of 3 or 4 feet diameter, and 12 to 18 inches high, revolving at a great velocity on a vertical axis. The sugar, either direct from the vacuum-pan or after it has been allowed to cool, is put, still mixed with the treacle, into the machine. As soon as the drum acquires a high velocity its contents are forced by the centrifugal action against the drum, the cylindrical portion of which is made like a sieve, and admits of the escape of the treacle, but retains the crystals of sugar. Some idea of the efficiency of those machines may be formed when it is stated, that in a machine of 3 ft. diameter, revolving at the usual speed of 1000 revolutions per minute, the tendency of the treacle to escape will be 514 times its own weight; that is to say, the treacle will have 514 times more force to fly off than it has to drop off the crystal by the mere force of gravity.

Sugar-refining was unknown to the ancients, and even the refining previously referred to as having been established in Germany in the 16th c. consisted merely in clarifying the syrup, and producing a sort of sugar-candy; but one improvement followed another, until the process may now be considered as almost perfect. The chief difficulties attending the operation arise from the circumstance that the material to be operated upon is ever varying in quality. Not only is there a difference between the produce of two different plantations, but even the manufacture of the same plantation shows differences of quality; these differences arising chiefly from the presence of foreign substances, which seriously interfere with the operations of the refiner. The attempts made to test the exact quality of solutions of raw sugar by means of polarized light (see above) have hitherto been attended with little success in practice. Sugar-refining, as practiced in Britain, has three distinct objects—(1) the production of loaves of thoroughly refined sugar; (2) crushed sugar; and (3) white sugar in separate crystals. The last is of comparatively recent introduction. In some existing sugar-refineries, old fashions still prevail; but our description must be confined to the most recent methods.

Sugar refining is carried on in the United States on a great scale, New York, Brooklyn, and New Orleans being the principal seats of the trade. There is comparatively little raw sugar used in Great Britain. Nearly all the yellow and dark-colored sugar sold in the shops has passed through the hands of the refiners, and is simply inferior sugar, made out of the syrup which drains from the white loaf-sugar.

Sugar-refineries are built eight or nine stories high, and the raw sugar is first hoisted to the upper story, where it is dissolved in large tanks of hot water, care being taken to use as little water as possible for the purpose. A quantity of bullock's blood is stirred into the solution of sugar, and the heat being gradually raised, the albumen of the blood coagulates, and rises to the surface in the form of a thick light scum, bringing with it nearly all the mechanical impurities floating in the fluid. The liquor, still hot, is then passed into bag-filters. Those filters are made of a very closely woven cotton cloth, capable of retaining the minutest mechanical impurity. In order to facilitate the passage of the liquor through the bags, they are suspended in a kind of iron closet, and surrounded by an atmosphere of steam to keep the liquor hot. From the bag-filters the liquor, now freed from all mechanical impurities, but of a dark color, flows into a lofty cylindrical iron filter, of about 5 or 6 ft. diameter, and 20 or 30 ft. high, filled with animal charcoal, that is, charcoal made of bones. This charcoal is reduced to coarse powder; and the dark offensive liquor is allowed to percolate very slowly through the mass. The result is, that it flows out at the bottom a perfectly transparent and pure solution of sugar. The charcoal can only be used for a few days at a time, because it gradually loses its purifying power; when the liquor begins to flow through it without

being purified, it is taken out of the filter, and reboiled, which completely revives its powers.

The liquor as it flows from the charcoal filter is a mixture of pure sugar and pure water, and perfectly transparent. The application of heat is the only mode of expelling the water, and this unfortunately blackens the sugar again. In order to get rid of the water with as little heat as possible, the colorless liquor is boiled in the vacuum-pan as in the early process of the manufacture. The liquor boils in vacuo at about 150° F., and even this moderate heat has the effect of turning it quite brown. When it has been sufficiently concentrated by boiling in the vacuum-pan, which takes from 1½ to 2½ hours, it is run into the sugar-loaf forms; which, after cooling, are carried to a room kept warm by means of steam-pipes. This warmth facilitates the flow of the treacle or syrup out at the aperture at the bottom of the form. To get rid of the coating of colored treacle which still hangs about the crystals of sugar, a small quantity of a saturated solution of pure white sugar is poured on the top of the form. This strong liquor is unable to dissolve any more sugar, but being more fluid than the sticky coatings of treacle or syrup adhering to the crystals, it mixes with the coatings, and makes them fluid enough to flow down to the bottom of the form, leaving the crystals clear of syrup or treacle, and consequently free of all color. This process of washing off the coloring matter from the crystals of sugar is the same in principle as the "claying" used in the production of sugar. The loaves of sugar, after standing some time, to admit of all the liquor draining off, are wrapped in paper, and dried in stoves heated by steam. The liquor draining from the forms is reboiled in the vacuum-pan, and forms loaves of an inferior quality; and the liquor draining from the inferior loaves is again boiled into the yellow sugars known among sugar-refiners as bastards.

Crushed or crashed sugar is simply inferior loaves crushed while still soft and moist, and packed in hogsheads, instead of being left in the loaf form.

The syrup which drains from refined sugar is reboiled, and constitutes the *golden syrup* of the shops.

Crystal Sugar.—In making the sugar crystals, all the processes are carried on as in refining, until the syrup is clarified. Then it is boiled or concentrated in a vacuum-pan of larger size than ordinary, and the concentration is carried on until minute crystals appear. Fresh syrup is then added from time to time, great care and experience being required to insure a regular feeding of the first-formed crystals, and prevent the formation of a second crop. When the crystals are large enough, the contents of the pan are transferred to the centrifugal machines, which quickly separate the crystals in a perfectly dry state from the uncrystallizable syrup. The crystals are of a square tabular form, with a deep groove across in one direction, dividing the crystal into equal parts. This kind of sugar is much liked for coffee, etc., but the crystals dissolve with difficulty.

The loss of such a large portion of the sugar in the processes of manufacturing has led to many inventions for the extraction of the juice, and for its more economical conversion into sugar. The cane mills now generally used are provided with three rolls, and with them the yield is not more than 70 to 80 per cent of juice, the lower limit being the more common. Seeing that with the most powerful rolls much juice is still left, other machines have been employed. Among these are the defibrators. In one of these the cane is reduced to a pulp; it then passes into a press, which squeezes out the juice. In another process the cane is put through a machine that breaks all the joints and outer covering; in this condition it is passed through an ordinary mill. The previous cracking of the joints allows a more constant and uniform pressure in the mill. Both of these methods give a better yield than the ordinary single milling. Duchassaing has invented a machine in which the cane first passes through one set of rollers; it is then carried along on an endless cloth to a second mill; between the first and second are a number of jets, which discharge boiling water upon the cane; thoroughly wetted, it goes through the second mill. With this machine the yield of sugar has been increased from 9.4 per cent to 11.04 per cent. The principle of osmotic action has been applied to extraction of the sugar. In the cane the sugar is held in solution in cells, inclosed by vegetable membrane. This membrane acts as the *septum*, and when the sliced cane is placed in water, the sugary solution in the cell passes out, until the density of the two liquids becomes the same. The water containing the sugar is then drawn off, and a new supply added, when the sugar again passes out; this process is kept up till all the sugar is extracted. If for every gallon of juice we use a gallon of water in the first step, one half the sugar would be extracted. To carry on the process economically, the first water should be applied to the second cane, and so on, till at last it should be as rich in sugar as the cane juice. The juice obtained in this way is free from all the crushed and broken cane. The cane is sliced diagonally into thin chips, so as to expose as large a surface as possible to the water. The inner part of the cane contains a richer juice than the outer, and less mineral matter than the knotty portions; the juice also varies in the different varieties and with different soils. According to Dr. Icery, of Mauritius, it contains water, 81, sugar, 18.36, mineral salts, .29, and organic substances, .35. The presence of a certain amount of uncrystallizable sugar is a source of great loss, as it not only does not crystallize itself, but prevents an equal amount of the sucrose from crystallizing. Fermentation converts sucrose into invert sugar. This takes place in the cane under the influence of air and a moderately high temperature. After the juice has been expressed the acid in it sets up fermentation. In

some climates sound cane can be kept for three or four months without injuring the sugar, but where it is very warm the juice should be pressed out as soon as the cane is cut. The amount of sugar can be closely estimated by the density of the juice, and the amount of mineral matter contained varies with the soil. The organic substances may be divided into three classes—albuminous, nitrogenous, and granular; the first class being one of the main causes of fermentation. When the juice is raised to the boiling point, the albumen coagulates and floats to the surface, carrying up with it the granular matter. The acidity of the juice is partly due to the granular and albuminous matter, and the effect of the nitrogenous is to prevent crystallization. For purifying the juice, heat and chemical and mechanical agents are employed. Heat, by killing the germs producing the acetous fermentation, checks it; it also drives off some of the acids, and under its influence the chemical changes go on much more vigorously. Steam has been found to be the most convenient method of applying heat, as it can be easily regulated. The acid in the juice is neutralized by lime, and the determination of the right amount requires careful experiment, different juices needing different quantities. It has been thought that lime might be replaced, with advantage, by the more powerful alkalis; but they have not come into use. The juice is run through filters, to remove those impurities that have not been taken out by heat and the chemicals. It is during the process of concentration that much of the sucrose is converted into uncrystallizable sugar, and it is at this stage that the temperature has to be carefully regulated. Fryer has devised a method of concreting the syrup at this stage without letting it go through the process of crystallization: the syrup flows down a shallow inclined pan, heated by a flue coiled beneath; at the lower end of the pan it falls into a reservoir, from which it passes into a revolving cylinder, heated by a current of hot air drawn through by a fan; when drawn out of this cylinder it cools into a hard mass, that can be packed in bags, ready for shipment. The inclined pan has a system of ridges, forcing the syrup to take a zigzag course, and bringing it into contact with much greater heating surface. The method of concentration of the syrup, by forcing a current of cold air through it, has been successfully employed, but has not come into general use. Considering the loss of crystallizable sugar that takes place during the concentration, and the great improvements that have been made in the cold-air machines, it seems that their employment would add largely to the yield. In La., one acre of cane weighs from 40,000 to 60,000 lbs. It is estimated that 1000 tons of cane take up from the soil about five tons of mineral matter. The central system, in which the planter sends his cane to a large factory to be made into sugar, instead of doing it himself, thereby saving the expense of the plant, is becoming common.

Sulphuric acid converts cane sugar into a black mass; it can also be employed to distinguish glucose from cane sugar. Since the manufacture of glucose has been so largely increased, its employment, in the adulteration of sugar, has become very common; it does not make the sugar unwholesome, but decreases its sweetening properties. Glucose rotates the polarized ray much more than cane sugar, so that the polariscope usually serves to detect the mixture. The salts contained in sugar prevent its crystallization. Dubrunfaut has employed the principle of osmotic action to remove them from molasses, thereby rendering a portion of it crystallizable. The value of the crude sugar for refining is determined by the amount of crystallizable sugar it contains, and its color indicates the amount of charcoal it will require. In the U. S., the manufacture of sugar from sorghum (q. v.) is attracting much attention; it is estimated that some varieties of sorghum contain as large an amount of sugar as the average Louisiana cane, and that it can be as easily extracted. Some of the sugar planters are experimenting with it, with a view to its introduction.

The total amount of sugar consumed in the United States in the year 1895 was 1,949,744 tons, of which 325,621 tons was produced in the United States. This consumption amounts to 62.6 pounds per capita. The sugar consumed in 1895 consisted of the following grades: refined product of imported sugar, 1,572,438 tons; manufactured from imported molasses, 15,000 tons; of cane, 324,506 tons; of maple, 7,500 tons; of beet, 30,000 tons; of sorghum and others, 300 tons. Leading refiners say that little or no sugar is manufactured from domestic molasses; also that in refining there is only about 2% loss of original. Messrs Willett and Gray, New York, state that of the sugar consumed in 1895 only about 182,964 tons were unrefined. The duty collected on sugar amounted in 1895 to \$15,354,290, and the amount of sugar bounties paid to sugar producers during the fiscal year 1892 was \$7,342,078; 1893, \$9,375,131; 1894, \$12,100,209.

SUGAR-CANE, *Saccharum*, a genus of grasses, natives of tropical and sub-tropical countries. The common sugar-cane (*S. officinarum*) is originally a native of the East Indies, was brought to the s. of Europe by the crusaders, and in the 15th and 16th c. found its way into all the European colonies within the tropics. In Europe the cultivation of the sugar-cane has always been very limited, and is scarcely practiced except in Sicily and Andalusia. In China it extends to 30° n. lat., and in North America to 33°; in the southern hemisphere only to 22° s. lat. The plant is a perennial with a creeping root, sending up a number of culms or stems, generally 8 to 12 ft. high, which have many joints, are of various colors, and about 1 to 2 in. thick. They are filled for about two-thirds of their length with a loose, sweet, juicy pith. The leaves are ribbon-shaped, and 4 to 5 ft. long, with a strong whitish middle nerve. The flowers are in great diffuse pyramidal panicles of a yard in length. The violet-colored sugar-cane (*S. violaceum*) is particularly esteemed, and much cultivated in the West Indies.—The Chinese sugar-cane

(*S. sinense*), cultivated in China, has the stem in great part covered with the sheaths of the leaves. Cultivation has produced many varieties of these species; if, indeed they are originally distinct species, and not themselves mere varieties.—The species of *saccharum* are numerous; they contain much silica in the rind, and some of them are much employed in India for thatching and for making mats, as well as for screens and light fences. The Bengalese make their pens of the hollow stems of *S. semidecumbens* and *S. fuscum*. See *illus.*, GRAIN, ETC., vol. VI., p. 874, fig. 9.

The sugar-cane is usually propagated by cuttings. For this purpose the top joints are used. The cuttings are planted in rows 3 or 4 ft. apart, and at intervals of about 2 ft. in the rows. The largest varieties, in rich moist soils, attain a height of 20 ft.; but in dry poor soils, the height is sometimes scarcely more than 6 feet. The plant *tillers*, like wheat, but not to the same degree. The cane-ground is kept clean by hand-hoeing, or by the plow. Hand-hoeing was formerly universal in the West Indies, but the plow is now very generally used where the nature of the ground permits. The best varieties are ready for cutting in about ten months from the time of planting, but other varieties require a longer period of growth, from 12 to 20 months. When the canes are fully ripe they are cut a little above the ground, and tied in bundles to be conveyed to the mill. Fresh canes called *rattoons* spring from the root, so that the plantation does not require to be renewed for several years; but the canes of the first crop are the largest, and a gradual decrease of size takes place. The ordinary practice on sugar estates is to renew a part of the plantation every year.

The name CHINESE SUGAR-CANE is sometimes given to the SHALOO or SUGAR-GRASS (*sorghum saccharatum*), already noticed in the article DURRA. A still more important sugar-yielding grass is the ordinary maize or Indian corn. The sorghum became known in America in 1857, and has latterly been extensively cultivated for producing syrup. It has long been known that sugar could also be obtained from the stalks of maize; but neither sorghum sugar nor maize sugar could till lately be made so as to compete commercially with the produce of the sugar-cane. Recently, however, an American gentleman—Mr. Stewart, of Murraysville, in Pennsylvania—has discovered a method of obtaining from both sorghum and maize crystallized sugar equal to the best kinds known. The processes are somewhat simpler than those in use for the sugar cane, and are more economical than those employed in making beet-sugar.

SUGAR-OF-LEAD, the common name for acetate of lead. See LEAD.

SUGDEN, EDWARD BURTENSHAW, 1781–1875; b. at London; was admitted to the bar in 1807; became king's counsel, 1822; solicitor-general and was knighted, 1829; lord chancellor of Ireland, 1835 and 1841–46; lord high chancellor of Great Britain, 1852. He is the author of *Law of Vendors and Purchasers* (1805), *Powers* (1808), *Law of Property as administered by the House of Lords* (1849), and other works of legal importance.

SUGGESTIO FALSI (Lat., “the suggestion of falsehood”) means giving a false impression without having made a decidedly false statement. This expression is applied to the sophistry practiced in oratory. See SUPPRESSIO VERI.

SUHL, a t. of Prussia, province of Saxony, and government of Erfurt, is situated on a small stream, called the Lauter, in a romantic valley on the s.w. side of the Thuringian forest, 30 m. s.s.w. of Erfurt. Pop. '95, 11,887.

SUHM, PETER FREDERIK, a Danish historian, was b. in Copenhagen, Oct. 18, 1728, of an ancient and noble family, and was sent to the university of Copenhagen, where he graduated in law in 1748. A few years later he went to Norway for the sake of prosecuting his studies in philology and history, in conjunction with the learned historian Schöning, and did not return till 1765 to Copenhagen, where he continued to reside till his death in 1898. Among his numerous works on the early mythical and political history of Denmark we may instance the following: *Forsoeg til Forbedringer i den gamle danske og norske Historie* (1757); *Om de nordiske Folks ældste Oprindelse* (1770); *Om Odin og den hedenske Gudelære* (1771); *Kritisk Historie af Danmark i den hedenske Tid*, (4 vols., 1774–81); *Danmarks Historie* (1782–1828). Besides numerous other historical essays, moral treatises, poetic compositions, contributions to the philosophical and literary periodicals of Germany, France, and Denmark, etc., he edited *Scriptores Rerum Danicarum Mediæ ævi*, from vol. iv. to vol. vii. inclusive (Hafniæ, 1776–92), and took upon himself the cost and supervision of the publication of many remains of old northern literature. Suhm was an indefatigable collector of rare and curious books; and in 1796, in return for a pension from the government, he made over to the royal library of Copenhagen his valuable library of 100,000 volumes, to which he had previously allowed the public access. He had copies made of the more valuable MSS. in the collection; besides which he founded scholarships and afforded direct pecuniary assistance to many poor students and learned men. He died in 1798. Suhm's collective writings were brought out by S. Poulsen, in 16 vols., between 1788–99.

SUICIDE (Lat. self-murder) is a heinous crime, by the law of the United Kingdom, though it was treated as venial by the Roman law, and was the subject of panegyric by Stoic philosophers. The law of England treats it as a felony, and hence there may be accessories to it, so that if A persuade B to kill himself, and B does so, A is guilty of murder. Suicide, or *felo de se* (q.v.), not only includes one who deliberately kills himself, but also one who in maliciously attempting to kill another is himself killed. If A, however, requests B to kill him, and B does so, A is not a *felo de se*, though B is a murderer. If A and B mutually agree to commit suicide together, and in the attempt one

only dies, the other is guilty of murder. When it is said that a man was a suicide, this implies that he was in his senses, for otherwise he committed no crime; hence an insane person, unless when in a lucid interval, cannot commit the crime. The punishment inflicted on a suicide consisted, formerly, in an ignominious burial in the highway, with a stake driven through the body, and without Christian rites, also the legal consequence was forfeiture of the goods and chattels to the crown. The only consequences now are forfeiture of goods. An act of 1824 permitted burial in churchyards without rites, between 9 and 12 P.M.; the interments (*felo de se*) act of 1882 sanctioned burial at any hour, and with the usual rites. An attempt to commit suicide is not punishable like an attempt to murder a third party, nevertheless it is a misdemeanor. The consequences of suicide on the contract of life-assurance are generally guarded against by an express stipulation that, if the assured die by his own hand, the policy shall be void; and it has been held by the courts that the policy is forfeited even though the party destroyed himself in a fit of frenzy or delirium.

There are, no doubt, even in modern times, some who hold the theoretical opinion that suicide is permissible in certain circumstances, but in regard to those who have actually permitted or attempted the crime, there has almost always been detectable evidence of cerebral changes, or, at all events, of that irritation and excitement which initiate and accompany molecular disorganization of the nervous structure. In short, suicide, as a rule, is a symptom of some form of insanity, permanent or temporary, in which the emotions and passions are excited or perverted. Suicide is likewise a concomitant of certain bodily diseases; for example, of dilatation and fatty degeneration of the heart, of blood degeneration, of affections of the intestinal mucous membrane, of the uterus, and of the brain and nervous matter; and it may be regarded as a frequent sequence of the melancholic, the morose, and hypochondriacal temperament. It has appeared as an epidemic; it has been observed as a hereditary tendency in certain families, and as a tendency more frequently exhibited by males than females; more frequently by the educated and affluent than by the industrial and ignorant classes; most frequently in large cities, and as directly engendered by luxury, political agitation, gambling, intemperance, and demoralization. It would appear, however, that indulgence and asceticism, riches and extreme poverty, claim nearly an equal number of victims. It has been calculated that twice as many artisans commit suicide as laborers. Accurate observation has shown that from 20 to 35 is the most influential age in inducing the suicidal tendency, and the age appears to determine, to a certain degree, the modes of death selected as well as the proclivity. As might be expected, the nature of the delusion, the accessibility of the means, imitation, the profession or pursuit of the individual, novelty, and notoriety, all influence the choice of the instrument or means of death. The theomaniac dies by crucifixion; the great majority by ropes, rivers, wells, razors, arsenic; the medical man by aconite, chloroform. Even sex is characterized by peculiar preferences. Females seek voluntary death according to the following order of the means—hanging or strangulation, abstinence, precipitation, drowning, cutting, poison; males, again, according to this order—cutting, shooting, hanging, poison, drowning. Race, climate, country, and the distinguishing polity of different societies to a certain extent affect the proportion of suicides to the population. In European cities the number of suicides per 100,000 inhabitants is as follows: Paris, 42; Lyons, 29; St. Petersburg, 7; Moscow, 11; Berlin, 36; Vienna, 28; London, 23; Rome, 8; Milan, 6; Madrid, 3; Genoa, 31; Brussels, 15; Amsterdam, 14; Lisbon, 2; Christiania, 25; Stockholm, 27; Constantinople, 12; Geneva, 11; Dresden, 51. Madrid and Lisbon show the lowest, Dresden the highest figure.

The causes of suicide in European countries are reported as follows: Of 100 suicides: madness, delirium, 18 per cent.; alcoholism, 11; vice, crime, 19; different diseases, 2; moral sufferings, 6; family matters, 4; poverty, want, 4; loss of intellect, 14; consequence of crimes, 3; unknown reasons, 19.

The number of suicides in the United States, for the years, 1882–1887, was 8226. Insanity was the principal cause, shooting the favorite method. 5386 acts of suicide, were committed in the day and 2419 in the night.

SUIDÆ, a family of mammalia, of the order *Pachydermata*, having the feet generally four-toed, the hinder feet some times three-toed; the toes hoofed, the two front toes forming the principal part of the foot, the others smaller and scarcely touching the ground; the snout abruptly truncated, mobile, muscular, and sensitive, but not elongated into a proboscis; the tail short, or almost wanting; the incisor teeth variable in number, the lower ones all directed forward, the canines projecting, and bent upward; the stomach little divided. To this family belong hogs, wart-hogs, peccaries, etc.

SUIDAS, the name given to the compiler of a *Lexicon* some time during the Byzantine empire. When he lived, or who he was, or whether he was even called Suidas, no one can say, but it is customary to place him about the 10th or 11th century. The *Lexicon* bears unmistakable evidence of having gone through many hands; and though we can fix the date when several of the articles *must* have been written, it is impossible to ascertain whether they are the compositions of the first compiler or of a later editor. The work is a sort of cyclopedia, giving an explanation of words, and notices of persons, places, etc., in alphabetical order. It is utterly destitute of literary or critical merit, but is valuable in the eyes of scholars on account of its numerous extracts from ancient Greek writers, grammarians, scholiasts, and lexicographers, whose writings in many

cases have perished. The first edition appeared at Milan (1499): since then the best editions have been those of Küster (Camb. 3 vols. 1705), Gaisford (Oxf. 3 vols. 1834) Bernhardt (Halle, 2 vols. 1834), and J. Bekker (Berl. 1854).

SUI GENERIS (Lat., "of its own kind"). From its signification this term has come to denote that which is peculiar or unique.

SUI JURIS, in the Roman law, the condition of a person not subject to the *Patria Potestas* (q.v.). The paterfamilias was the only member of a family who was *sui juris*, all the rest being *alieni juris*, including sons, unmarried daughters, the wife, and the wives and children of the sons of the paterfamilias. A daughter, on her marriage, passed into the family of her husband, but a son did not become *sui juris* by marriage. A son or unmarried daughter became *sui juris* on the death of the paterfamilias. In his father's lifetime a son could only become *sui juris* by emancipation. The laws of the twelve tables declare that a son three times sold by his father should be freed from his power; and the ceremony of emancipation was of the nature of a fictitious sale gone through three times, in order to liberate the son from parental control. *Connubium* being the foundation of the *patria potestas*, a bastard was *sui juris*.

SUIR, a river of Ireland rising in the n. of the county of Tipperary, flows s. through that county by the towns of Thurles and Cahir; 10 m. s. of Cahir it bends eastward, forming the boundary of Tipperary and Waterford, and passing by Clonmel and Carrick. It then passes out of Tipperary, and meeting the Barrow at Passage, Waterford, falls into the sea in Waterford Haven, after a course of about 100 m. It is navigable by barges as far as Clonmel.

SUL, RIO GRANDE DO. See RIO GRANDE DO SUL.

SULEIMAN PASHA, abt. 1838-92. His original nationality was never discovered, though he was supposed to be a Pole who had embraced Mohammedanism. He became famous during the Russo-Turkish war, 1877-78. His attacks on Shipka Pass, though unsuccessful, won for him a reputation for great courage, and he was made commander-in-chief of the Turkish forces in Roumelia. Notwithstanding his victory at Elena and his battle near Metchka, 1877, he did not give satisfaction to the Turkish government, and was degraded from his post early in 1878.

SULFONAL. See HYPNOTICS.

SULIMAN' MOUNTAINS, a mountain range upward of 350 miles in length, running from n. to s., and forming the boundary between Afghanistan and the Punjab. In lat. about 33° 20', it throws off the lateral branch of the Salt Range (q.v.). The highest summit of the range is Tacht-i-Suliman (Solomon's throne), 11,000 ft. high, and covered with snow for three months of each year.

SULINA, one of the lower branches of the Danube (q.v.), flows through the middle region of the delta of the great river, and enters the sea at about the same distance from the Kilias mouth on the n. and St. George's mouth on the south. It is the smallest outlet of the Danube, and conveys only $\frac{2}{3}$ of the main river to the sea.

SULIOTS, a tribe who inhabited the valley of the Acheron, in the pashalik of Janina (*Epirus*) in European Turkey, are a mixed race, being partly of Hellenic and partly of Albanian origin. They are the descendants of a number of families who fled from their Turkish oppressors to the mountains of Suli (whence they derive their name) during the 17th century. In this obscure corner of the Turkish empire they prospered; and toward the close of the 18th c., numbered 560 families, inhabiting 90 hamlets. For about 51 years they heroically resisted the encroachments of Ali Pasha (q.v.) of Janina upon their independence, the very women taking part in the strife. Vanquished in 1803, they retreated to Parga, and afterward to the Ionian islands, where they remained till 1820, when their old oppressor, Ali Pasha, finding himself hard pressed by the Turks, invoked their aid, offering them guaranties for his faith, and his grandson as a hostage. Eager to return to their cherished home, they accepted these terms, and under Marcos Bozzaris (q.v.), maintained a long and desperate conflict with the Turks, but were ultimately forced again to flee from their country, and take refuge to the number of 3,000 in Cephalonia, though a large remnant preferred to skulk in the neighboring mountains. Though they took a glorious part in the war of Greek independence, their country was not included by the treaty of 1829 within the Greek boundary-line; but most of them established themselves in Greece, where their leaders were raised to important offices. The old seat of the Suliots lies in a portion of Epirus which the Berlin congress of 1878 recommended to be restored to Greece.—See Perriæbos's *History of Suli and Parga* (2d Greek ed., Venice, 1815; Eng. trans. 1823); and Ludemann's *Wars and Ballads of the Suliots* (Leip. 1825).

SUL'LA, L. CORNELIUS, surnamed by himself FELIX, the ablest Roman after the younger Scipio until the appearance of Julius Cæsar, was b. 138 B.C. His family was a member, but not a distinguished one, of the Cornelian gens, or "clan." In 107 B.C., he was elected questor, and sent to Africa with the cavalry that the consul Marius (q.v.) required for prosecuting the Jugurthine war. He rapidly acquired a brilliant reputation as an officer, and crowned a series of important services by inducing Bocchus, the Mauritanian king, to surrender Jugurtha, whom he brought in chains to the Roman

camp (106 B. C.). Marius was not over well pleased at the distinction achieved by his subordinate. In the campaigns that followed (104-101 B. C.) against the Cimbri and Teutones, Sulla's reputation continued to rise, although Marius was still regarded (and with justice) as the first general of the state. For several years after the destruction of the barbarians, Sulla lived quietly, taking no part in public affairs; but in 93 B. C. he stood for the pretorship, and won it by a liberal distribution of money among the people. Next year, he was sent to Cilicia as propretor, to replace Ariobarzanes on the throne of Cappadocia, from which he had been driven by Mithridates. On his return to Italy (91 B. C.), the long smoldering animosity between Marius and him was on the point of bursting forth, but the terrible *Social war* forced all Romans to postpone their quarrels until the common danger had been averted. Both Marius and Sulla commanded armies in this great struggle; but the successes of Sulla threw those of Marius into the shade, and the mortification of his rival was deep and bitter. In 88 B. C., Sulla was elected consul along with Q. Pompeius Rufus, and the senate conferred on him the command of the Mithridatic war. But this was a command that Marius himself passionately desired, and when he heard that Sulla had obtained it, he rushed headlong into treason and civil war.

Here it may perhaps be necessary to observe that Marius and Sulla were not only personal rivals, but the leaders of opposite political parties. The former, a man of humble origin (see MARIUS), was a rough, stubborn, irascible, and illiterate *plebeian*; the latter, a finely cultivated *patrician*, subtle and sagacious in policy, and winning in manners. In the terrible scenes that ensued, although Sulla showed himself by far the fiercer and more sanguinary of the two, it should not be forgotten that it was Marius who commenced the contest. Allying himself with the tribune P. Sulpicius Rufus, a political adventurer in difficulties, Marius placed himself at the head of the new Italian party, on which the rights of Roman citizenship had been conferred, and hoped to force the senate to recall the appointment of Sulla to the command of the expedition to the east. Sulla was compelled to flee to Nola in Campania, where his camp then was; but finding the soldiers full of enthusiasm, he resolved to lead them against the pseudo-government that had been established at Rome. The story of the overthrow of the Marian party, the expulsion of Marius, and his subsequent wanderings in Africa, etc., are well known, and intimately as these events are inwoven with the fortunes of Sulla, cannot be repeated here. Suffice it to say, that after settling affairs at Rome as well as he could, Sulla embarked for the east (87 B. C.), and was away for four years. Most of his fighting, however, was done in Greece against Archelaus, an ally of Mithridates, whom the latter repeatedly subsidized with men and money. Athens was stormed and plundered (86 B. C.), and Archelaus himself was defeated with frightful slaughter at Chæroneia in the same year, and again in the neighborhood of Orchomenos (84 B. C.). Sulla now crossed the Hellespont, crushed Fimbria, a general sent out by the Marian party (which in Sulla's absence, had again got the upper hand in Italy), forced Mithridates to sue for peace, and after extorting heavy contributions from the cities of Asia Minor, sailed for Italy, and landed at Brundisium in the spring of 83 B. C. Marius was now dead, but his party were strong in numbers, if not in organization; yet, before the close of 82 B. C., the Marian party in Italy was utterly crushed. In Spain, however, under the gallant and high-souled Sertorius (q. v.), it held out for ten years longer.

When Sulla felt himself master of the situation, his thoughts turned to revenge. Then followed the fearful period of the *proscriptions* (81 B. C.)—a virtual "reign of terror" throughout Italy, the object of which was literally to extirpate the Marian party. In this, however, it was only partially successful; and the next generation saw that party rise to more splendid predominance than ever in the person of Julius Cæsar (q. v.), nephew of old Marius. In 81 B. C., Sulla got himself appointed dictator, an office which he held until 79 B. C. This period was signalized by his framing a series of laws—often spoken of collectively as the "Sullan legislation"—the design of which was to make the senate and the aristocracy as vigorous and powerful as in the times of the Punic wars, but which utterly failed of its end.

On resigning his dictatorship, Sulla retired to his fine estate at Puteoli, to enjoy at his ease those sensual pleasures to which he had been deeply addicted from his earliest manhood. Literature, wine, and women were luxuries in which he had always indulged, but now he wholly devoted himself to them—in a sort of *swinish* manner. It is strange to reflect that the man who undertook to legislate with the view of mending the public morals, should himself have surpassed in profligacy all his contemporaries. What more convincing proof could we have that morality in Rome had ceased to be more than a name! Sulla's debaucheries hastened his end. He died 78 B. C., when only 60 years of age, of the disgusting disease known as *morbus pediculosus*.

SULLIVAN, a co. in s. w. Indiana, having the Wabash river for its w. boundary separating it from Illinois; 440 sq. m.; pop. '90, 21,877, chiefly of American birth. It is intersected by the Evansville and Terre Haute and the Indiana and Illinois Southern railroads; drained by the Wabash and Busseron creek. Co. seat, Sullivan.

SULLIVAN, a co. in n. Missouri, crossed by the Burlington Route and the Quincy, Omaha, and Kansas City railroads, and drained by Musclev river, the e. fork of Medicine creek, and the middle and w. forks of Locust creek; 656 sq. m.; pop. '90, 19,000. Co. seat, Milan.

SULLIVAN, a co. in s.w. New Hampshire, bounded by the Connecticut river on the w., and partly by lake Sunapee, on the e., intersected by the Boston and Maine railroad, drained by the Ashuelot and Sugar rivers; 547 sq. m.; pop. '90, 17,304. The surface bordering the Connecticut is level. Co. seat, Newport.

SULLIVAN, a co. in s.e. New York, having the Delaware river for its w. and s.w. boundary, separating it from Pennsylvania; 911 sq.m.; pop. '90, 31,031. Co. seat, Monticello.

SULLIVAN, a co. in n.e. Pennsylvania, drained by the Susquehanna river, Loyalsock and Muncy creeks; 446 sq.m.; pop. '90, 11,620. Co. seat, Laporte.

SULLIVAN, a co. in n.e. Tennessee, bordered by Virginia, crossed by the East Tennessee, Virginia and Georgia railroad, drained by the Holston river and its branches; 410 sq.m.; pop. '90, 20,879. Co. seat, Blountville.

SULLIVAN, ALEXANDER, b. Me., 1846, of an Irish family; studied law in New York, and has been for a number of years in successful practice in Chicago. He was an active abolitionist and an earnest advocate of negro suffrage, and until 1872 a republican. Being a strong friend of Horace Greeley, he supported the liberal movement, and eventually joined the democrats. In the presidential campaign of 1884, however, he returned to the republicans, and made numerous speeches for Mr. Blaine. He became pres. of the Irish National League of America on its formation.

SULLIVAN, ARTHUR SEYMOUR, composer, b. in London, May 13, 1842. He studied at the Royal Academy of Music, and at the Leipsic Conservatorium, and returning to London became organist at St. Michael's church, Chester square, London. In 1874-'6 he organized and conducted the band of the Royal Aquarium company, and conducted the Glasgow and Leeds Festivals in 1880-'3. In 1876-81 he was principal of the National Training school at South Kensington, and since 1880, a member of the Council of the Royal College of Music. In 1878 he received the decoration of the Legion of Honor, and was knighted in 1883. Cambridge gave him the degree of Mus. Doc. in 1876, and Oxford in 1879. His fame rests chiefly upon his light operettas, to which Gilbert contributed the text. Their beauty of melody, skilled treatment, and humor and quaintness of style have never been equalled in comic opera. They are: *Cox and Box*, London, 1867; *Trial by Jury*, 1875; *The Sorcerer*, 1877; *H. M. S. Pinafore*, 1878; *The Pirates of Penzance*, 1880; *Patience*, 1881; *Iolanthe*, 1882; *Princess Ida*, 1884; *The Mikado, or the Town of Titipu*, 1885; *Ruddygore, or the Witch's Curse*, 1887; *The Yeomen of the Guard*, 1888; and *The Gondoliers, or the King of Barataria*, 1889. He has also written two oratorios: *The Light of the World*, 1873, and *The Martyr of Antioch*, 1880; several cantatas and overtures; incidental music to *The Tempest*, 1862; *The Merchant of Venice*, 1871; *The Merry Wives of Windsor*, 1874; *Henry VIII.*, 1878; and *Macbeth*, 1888; anthems, songs, and part-songs. In 1891 he produced at the Haymarket, London, the grand opera in English, *Ivanhoe*, which met with great success.

SULLIVAN, BARRY, tragedian, was born in Birmingham in 1824. He made his first appearance on the stage at Cork, in 1840. After studying for some time in Ireland, he joined the company of the Theatre Royal, Edinburgh, and remained there several seasons, advancing rapidly in his profession. In 1852 he appeared at the Haymarket Theatre, London, as Hamlet, with marked success. Later he had engagements at the St. James, Sadler's Wells, and Drury Lane. In 1857 he visited America, and was warmly received in the United States and Canada. In 1861 he went to Australia, where his success was so great, that he played nearly one thousand nights in Melbourne alone. He then visited India, and completed his tour of the world in 1866. In 1869 and 1870 he was lessee of the Holborn theater, afterwards making a tour in America and Australia. He made a second visit to the U. S. in 1875, and died 1891.

SULLIVAN, JOHN, LL.D., 1740-95; b. Me.; in early life was a successful lawyer, but held his profession subservient to his zeal for American liberty. He was a member of the first continental congress; and through the darkest periods of the revolutionary war, he ranked among the ablest leaders of the American armies. In the siege of Boston he was next in command to Gen. Lee. When, in the battle of Long Island, in 1776, Gen. Greene was disabled by sickness, Sullivan was selected to command his division of the army. Serving afterward under the immediate supervision of Washington, Gen. Sullivan was distinguished for his discretion and valor in the battles of Trenton, Princeton, Brandywine, and Germantown. In 1778 Washington and count d'Estaing arranged for the French fleet to attack the British near Rhode Island, and Sullivan was sent with a large force to co-operate in besieging Newport. On the day appointed for the combined attack, a violent storm so shattered the French vessels that they withdrew from the contest. After defeating the English in one engagement, the American forces retired from Rhode Island. In 1779 Sullivan was sent with a large force into western New York to take vengeance upon the hordes of Indians and Tories who, besides other atrocities, had massacred the inhabitants of Wyoming and Cherry valley. The savages were dispersed, many were killed, and their villages destroyed. In 1780 Gen. Sullivan resigned his commission and returned to New Hampshire and to his profession of the law. After successfully filling many important civil and judicial offices, died at Durham, N. H.

SULLIVAN, JOHN LANGDON, 1777-1865, b. Maine; studied canal construction in England and on the continent. He was agent and engineer of the Middlesex canal, 1804-11. He was associate civil engineer of the U. S. board of internal improvements, 1824-25, and published reports on the feasibility of a canal through the Alleghanies. He afterwards practised medicine, adopting the homeopathic system. In 1814 he received a patent for the invention of the steam tow-boat, being given priority over Robert Fulton.

SULLIVAN, JOHN LAWRENCE, pugilist, was born at Boston, Mass., in 1858. As a boy he worked as a day laborer, but in 1879 began to spar in public without attracting attention until 1880, when in a contest with the veteran Joe Goss at the Boston Music Hall, Sullivan showed remarkable qualities as a fighter. In the same year he visited Cincinnati and won a boxing-match with John Donaldson. In February, 1882, Sullivan fought his first prize-fight, defeating "Paddy" Ryan, a leading pugilist. Subsequent contests in which he was equally successful were those against James Elliott (1882); "Tug" Wilson (1882), Herbert Slade (1883), Alfred Greenfield (1884), and Ryan again (1886). In 1888 Sullivan met Charles Mitchell in a prize-fight near Chantilly, France, and fought thirty-nine rounds to a draw. In 1889, he won a fight with Kilrain, but was beaten in 1892 by James Corbett. In 1890-91 he profited by his notoriety, appearing as an actor in a play called *Honest Hearts and Willing Hands*.

SULLIVAN'S ISLAND, a large island, 6 m. below Charleston, S. C., between the harbor and ocean, the site of Fort Moultrie, now dismantled, and of the summer residences of the wealthy inhabitants. When Fort Moultrie was evacuated by Maj. Anderson, Dec. 26, 1860, several batteries were erected on the shore of this island, bearing upon the channel and Fort Sumter.

SULLIVANT, WILLIAM STARLING, LL.D., 1803-73; b. Franklinton, Ohio; graduate of Yale college, 1823; became a surveyor and resident of Columbus, and published catalogues and specimens of plants and mosses. He has made contributions to the bryology and hepaticology of North America; to Asa Gray's *Manual of Botany*, and numerous other works, besides contributing valuable papers to scientific journals. Associated with L. Lesquereux he published *Musci Boreali-Americani*, consisting of 350 species and varieties of dried mosses. He discovered a plant of the saxifrage family on which was founded the genus *Sullivantia*.

SULLY, a co. of S. Dakota, bounded on the w. by the Missouri river, and drained by its branches; 1050 sq. m. Pop. '90, 2412. Co. seat, Ouida.

SULLY, JAMES, was born at Bridgewater, Somersetshire, in 1842, and educated in the Independent college, Taunton, the Regent's Park college and the university of Göttingen. In 1892 he became Grote prof. of philosophy of mind and logic in University college, London. He is the author of *Sensations and Intuition: Studies in Psychology and Aesthetics* (1874); *Pessimism: a History and a Criticism* (1877); *Illusions* (1883); *Teachers' Handbook of Psychology* (1886); *The Human Mind* (1892); *Studies of Childhood* (1895).

SULLY, MAXIMILIEN DE BETHUNE, Duke of, the celebrated minister of Henry IV. of France, was the second son of François, baron de Rosny, and was born at Rosny, near Mantes, in 1560. The Rosny family, an offshoot from the great house of Flanders, was never possessed of much wealth or influence, and had severely deteriorated in both respects during the early religious wars. Sully was at an early age committed to the care of Henry of Navarre, the head of the Huguenot party, which not only obtained for him an excellent education, but laid the foundation of a companionship which lasted, without intermission, till Henry's death. After narrowly escaping during the St. Bartholomew massacre, he accompanied his patron in his flight from court (1575), and during the civil war which followed, exerted himself to the utmost, by daring valor in the field and otherwise, to serve the master for whom he cherished the most absorbing devotion. After Henry's authority had been well established, Sully, who had for some years previous been his trusted adviser, became (1597) counselor of state and of finance. The financial affairs of the country were then in a frightful condition; from the chief of the department down to the very lowest country agent, the administration was an organized system of pillage, and but a small percentage of the taxes levied found its way into the imperial treasury. The baron de Rosny was the very man to remedy this state of matters; rude, obstinate, and haughty, but at the same time resolute, active, indefatigable, wholly devoted to his master's interests; and backed by the influence of Gabrielle d'Estrees, and by Henry's own clear-sighted convictions, he cared nothing for the clamor and hatred of the court, which had largely profited by the former state of chaos. Not content with regulating the affairs of the revenue from the seat of power, he made a tour through the chief provincial districts, armed with absolute authority, personally examined the accounts, dismissed or suspended delinquents, and largely replenished the treasury with the ill-gotten wealth which he compelled them to disgorge. By indomitable perseverance, he little by little brought the affairs of the country into an orderly state; although in the diminution of the expenditure his efforts were by no means so successful, as the king, his mistresses, and the other companions of his pleasures, combined to oppose all retrenchment as far as they were concerned. In 1596 the disposable revenue of the state was 7 to 9 millions; in 1609 it was no less than 20 millions, with a

surplus of 20 to 22 millions in the treasury, and the arsenals and fleet in a state of excellent equipment. Sully, however, was more than a mere financier; he had the supreme charge of various other branches of the administration, zealously promoted agriculture by diminishing the taxes of the peasantry, encouraging export trade, draining marsh-lands, and constructing numerous roads, bridges, and causeways. Sully was the servant of the king and government alone, and was of necessity disliked by the people for his severity, by the Catholics for his religion, and by the Protestants for his invariable refusals to sacrifice the smallest jot of his master's or the country's interest for their sake. Accordingly, with the death of Henry, his career of supremacy was at once ended, and he was forced to resign the superintendence of finance, Jan. 26, 1610, though he retained his other high offices, and was presented by Marie de Medicis with 300,000 livres as acknowledgment of his services. He had been created duke of Sully and peer of France in Feb., 1606. Sully wrote three treatises on war and police, which are lost, and two pieces of verse which are extant; but the work which will ever be connected with his name is the *Mémoires des sages et royales (Economies d'Etat, etc., de Henry le Grand)*; a dull, wearisome, and disorderly collection of writings, but of priceless value to a historian of Henry IV.'s time. Sully printed the first two volumes of the *Mémoires* at his own château of Sully in 1634; the third and fourth were published at Paris in 1662, and the whole has been several times republished. Sully died at Villebon, Dec. 22, 1641.

SULLY, THOMAS, 1783–1872, b. England; brought to this country by his parents. From 1798–1804 he resided in Charleston, S. C., studied art and produced some juvenile pieces. He then settled in Richmond, Va., and later in New York, in both places practicing the profession of a portrait painter with great success. In 1810 he removed to Philadelphia, where the rest of his life was spent, with exception of visits abroad, in one of which he painted an excellent portrait of queen Victoria. The Boston Museum possesses his most ambitious work, "Washington Crossing the Delaware." Among his best portraits were those of Cooke the tragedian as Richard III., Fanny Kemble, Dr. Rush, Decatur, Jefferson, and Lafayette.

SULLY-PRUDHOMME, RENÉ FRANÇOIS ARMAND, French poet, was born in Paris in 1839, was educated at the Lycée Bonaparte, and spent some time as a lawyer's assistant. His first volume of poems appeared in 1865. Other collections of poems are, *Les Épreuves* (1866); *Les Solitudes* (1869); *Les Destinées* (1872); *Les Vaines Tendresses* (1875); *La Justice* (1878); and a translation of Lucretius, *De Natura Rerum* (1869). He was elected to the Academy in 1881. An edition of his works was published (1883–4).

SULMONA, or **SOLMONA**, a city of southern Italy, province of Aquila, in Abruzzi. Pop. '81, 17,600. It is situated in a vast fertile plain watered by two rivers, and bounded by hills. It is the ancient *Sulmo*, the birth-place of Ovid, and of Pope Innocent VII.

SULPHATES. See **SULPHURIC ACID**.

SULPHIDES, METALLIC, formerly known as *sulphurets*, are combinations of sulphur with a metal. Many of them occur native, and form highly valuable ores. They are all solid at ordinary temperatures, and, with the exception of those of potassium, sodium, calcium, strontium, barium, and magnesium, are insoluble in water; they are, moreover, conductors of electricity. Many of them, especially of those that occur native, exhibit very brilliant and characteristic colors. The same metal may have several sulphides, and in general there is a sulphide for each oxide. The sulphides are, however, sometimes the more numerous. Most of these compounds may be fused at a heat a little above redness, and if the air be excluded, the protosulphides (those containing one atom of sulphur and one atom of metal) remain unaffected; but many of the higher sulphides, such as the bisulphide of iron, FeS_2 , and the bisulphide of tin, SnS_2 , give off an atom of sulphur, and are reduced to protosulphides. If, however, there is a free admission of air or of oxygen gas to the heated sulphides, they are all decomposed, the sulphur becoming oxidized, and passing off as sulphurous acid, SO_2 , while the metal usually remains in combination with oxygen. When heated before the blowpipe, most of the sulphides evolve an odor of sulphurous acid, and very small quantities of soluble sulphides may be detected in neutral or alkaline solutions by the addition of a solution of nitroprusside of sodium, $\text{Na}_4(\text{CN})_6(\text{NO})_2\text{Fe}_2 + 4\text{H}_2\text{O}$, when a magnificent purple color, which, however, is not permanent, is evolved. It has very recently been discovered by Mr. Barrett, and announced in his paper, "On some Physical Effects produced by the contact of a Hydrogen Flame with various Bodies," in the *Philosophical Magazine* for Nov., 1865, that the sudden appearance of a blue color when the hydrogen flame is brought in contact with a body containing sulphur, is a most delicate test for the presence of this element, detecting it even when the nitro-prusside of sodium test fails. By this test Mr. Barrett detected $\frac{1}{1000000}$ of a grain of sulphur.

The sulphides are prepared in various ways, of which it is sufficient to notice the most important. (1.) The protosulphides of the metals of the alkalies and alkaline earths may be obtained by decomposing their sulphates by igniting them in closed vessels with charcoal, the oxygen being removed in the form of carbonic oxide. (2.) Many of the metals, when heated with sulphur, combine directly with it; sulphide of iron, for example, is usually prepared in this manner. (3.) Hydrated sulphide of tin, titanium, molybdenum.

tungsten, vanadium, arsenic, antimony, bismuth, copper, lead, mercury, silver, gold, and platinum with its allied metals may be obtained by passing a stream of sulphuretted hydrogen through neutral or acid solutions of their salts, when they are precipitated in an insoluble form; and the hydrated sulphides of zinc, iron, manganese, cobalt, and nickel may be prepared by double decomposition, by mixing a solution of the salt of the metal with a solution of a sulphide of one of the metals of the alkalies, as, for example, sulphide of potassium: thus, sulphate of zinc, if mixed with sulphide of potassium, yields sulphate of potash, which remains in solution, and sulphide of manganese, which falls as an insoluble precipitate. "In many cases," says prof. Miller, "the atoms of these hydrated sulphides are characteristic of the metal; for example, the hydrated sulphide of zinc is white; that of manganese, flesh red; those of cadmium, arsenic, and persulphide of tin are yellow; that of tersulphide of antimony is orange red; and that of hydrated protosulphide of tin is chocolate brown. The sulphides of molybdenum, rhodium, iridium, and osmium are brown, each with its peculiar shade, while in a large number of instances—including the sulphides of iron, cobalt, nickel, uranium, vanadium, bismuth, copper, lead, silver, mercury, gold, platinum, and palladium—the precipitated sulphides are of a black, more or less pure."—*Inorganic Chemistry*, 2d ed. 1860, p. 322. A recollection of the colors of these precipitates will save the young chemist a large amount of labor in testing for the presence of the metals.

SULPHOCYAN OGEN AND THE SULPHOCYANIDES. The former of these terms is given to a monobasic radical, SCN, or CyS, which has never yet been isolated, but which forms an acid compound, known as hydrosulphocyanic acid, HSCN, with hydrogen, and yields numerous metallic salts. These salts, known as sulphocyanides, may be represented by the general formula, M,SCN, where M represents any metal. The sulphocyanides of potassium, sodium, and ammonium are crystallizable and soluble in water; those of the heavy metals are comparatively insoluble. These salts do not possess the poisonous character of the cyanides. *Sulphocyanide of potassium*, KSCN, is anhydrous, but very deliquescent, and occurs in long streaked colorless prisms, somewhat resembling niter both in appearance and taste; it is extremely soluble in water, and fuses on the application of a gentle heat. The *sulphocyanide of mercury* is a white powder which possesses the property of swelling or growing in size to an almost incredible degree when moderately heated, so as to decompose it into a mixture of mellon, $C_6H_5N_3$, with a little sulphide of mercury. The resulting mass often assumes a most fantastic shape, and is sufficiently coherent to retain its form; it is of a yellow color externally, but black within. It is this sulphocyanide which is the ingredient of the well-known toy known as "Pharaoh's serpents." Each serpent consists of a little cone of tinfoil, resembling a pastille in shape, and filled with the above-named compound. On lighting the cone at the apex, there begins to issue from it a thick serpent-like coil, which continues twisting and increasing in length to an extraordinary degree, the serpent-like shape resulting from the salt being burned in the tinfoil cone. The compound is readily obtained by precipitating a strong solution of pernitrate of mercury with sulphocyanide of ammonium, which is most cheaply prepared by Mr. Wood's method from bisulphide of carbon.

SULPHOVINIC ACID, or ETHYL HYDROGEN SULPHATE, $C_2H_5 \cdot HSO_4$, is formed by mixing alcohol with an equal bulk of oil of vitriol. Great heat is evolved, and the two bodies enter partially into combination; this new compound acid possessing only half the saturating capacity of sulphuric acid. In connection with the theory of the formation of ether from alcohol and sulphuric acid, it may be observed that this sulphovinic acid is developed as an intermediate product, only when the temperature is raised to 212° F. This is one of the class of bodies to which the term *acid sulphuric ethers* is applied.

SULPHUR (symb. S, eq. 16—new system, 32—sp. gr. of rolled sulphur, 1.98 [see ATOMIC WEIGHTS], and of amorphous sulphur, 1.957; sp. gr. of vapor, 6.617 at 842° F. (450° C.), and 2.2 at 1680° F. (860° C.), atmospheric air being the unit of comparison for the vapor) is one of the most important of the non-metallic elements. At an ordinary temperature, it exists as a solid, brittle, tasteless, and inodorous body, of a characteristic yellow color, and insoluble in water. A piece of solid sulphur, heated to a temperature of 239° F. (115° C.), fuses into a thin yellow liquid; while in closed vessels, it may, by a further heat, be distilled, the boiling-point being about 842° F. (450° C.), and at this temperature it yields a deep yellow vapor, of sp. gr. 6.617. When the sulphur-vapor comes in contact with cold air, it condenses in the form of a fine yellow powder, known as *flowers of sulphur*. If fused sulphur be rapidly cooled, it solidifies into a compact mass, of a granular crystalline texture, and if, in its liquid state, it be allowed to run into cylindrical wooden molds, we obtain it in the ordinary form of roll-sulphur, or common brimstone; if, on the other hand, it be allowed to cool slowly, it crystallizes in long, glistening, deep, yellow, oblique prisms, with a rhombic base, which, however, soon lose their most characteristic properties. As native sulphur is frequently met with in yellow crystals, whose form is derived from the octahedron with a rhombic base, it is obviously a dimorphous substance. It has been already stated that sulphur fuses at 239° F.; from that temperature up to 302° F. (150° C.), it forms a yellow, transparent, limpid liquid; as the heat increases, the color becomes brown, and almost black, and the liquid viscid, these changes being very distinctly seen at 482° F. (250° C.). If the external application

of heat be steadily continued, it will be found that for a while the temperature remains constant, but it afterwards rises, and at nearly 752° F. (400° C.) the sulphur again liquefies, although less completely than when first melted. If suddenly cooled by pouring it, in a slender stream, into cold water, we obtain a spongy, tenacious, and plastic mass, which may be drawn out into elastic threads, whose color, after they have cooled, varies from an amber to a deep brown color, according to the heat that has been employed. After some hours the ductile sulphur loses its characteristic properties, increases in density, and returns to the brittle form; or, if heated to 212° F. (100° C.), suddenly returns to the brittle condition; the temperature rising to 230° F. (110° C.) during the change. Hence, sulphur may be obtained in three (at least) allotropic states, which are distinguished by the symbols $S\alpha$, $S\beta$, $S\gamma$. The first variety, $S\alpha$, is the native octahedral crystal of sulphur; it may be obtained artificially by dissolving sulphur in bisulphide of carbon, or chloride of sulphur, and submitting the solution to spontaneous evaporation. These crystals are semi-transparent, of an amber-yellow color, and undergo no change on exposure to the air. The second variety, $S\beta$, is the oblique prismatic crystal already described as being formed when fused sulphur cools slowly. The best method of obtaining these crystals is to melt a few pounds of sulphur, and allow it to solidify on the surface. On perforating the external crust with a hot wire, and pouring out the sulphur that remains liquid, the interior of the cavity is found to be traversed in all directions by these crystals, occurring as transparent brownish needles, having a specific gravity considerably less even than that of roll-sulphur. On exposure to the air they soon lose their coherence, and form an opaque and crumbling mass, consisting of minute rhombic octahedra. This conversion of the prismatic into the octahedral form takes place immediately if the prisms are immersed in bisulphide of carbon. The third variety, $S\gamma$, is the plastic amorphous sulphur, which has been sufficiently described. If sulphur be frequently heated to 600° , and suddenly cooled, a black variety of this element is produced; and a red variety has been obtained, but the redness is now supposed to be due to the presence of a trace of some fatty body.

Sulphur is a bad conductor of heat, and the mere heat of a warm hand often causes it to crackle, and even to fall to pieces, from the unequal expansion. It is an insulator of electricity, and becomes negatively electric by friction. It is slightly soluble in alcohol, ether, and the fatty oils; its best solvents being the bisulphide of carbon and chloride of sulphur. When heated in the air, it takes fire at about 473° F. (245° C.), burning with a blue flame, and becoming converted into sulphurous acid, whose pungent suffocating fumes are characteristic of sulphur. This element is second only to oxygen in its powerful affinity for other elements, with most of which it unites, and often in several proportions. With most of the metals it combines very readily, and in some cases, with a development of light and heat; thus, silver and copper burn in sulphur-vapor just as iron-wire or zinc-foil burns in oxygen. In consequence of its power, with the aid of heat, of forming sulphurous acid with the oxygen of the air, and thus rendering the latter incapable of supporting combustion, burning sulphur may be usefully employed for the extinguishing of fire—as, for example, in chimneys.

Sulphur occurs very widely distributed in the mineral kingdom, partly free and partly combined with other elements. The free sulphur is either found pure in regularly formed crystals, or intimately mixed with earthy matters. The principal sources of crystalline sulphur are Urbino in Italy, Girgenti in Sicily, and Radoboy in Croatia; while the earthy sulphur is mainly derived from Italy, Moravia, and Poland. Iceland is rich in both varieties, but the mineral wealth of that island remains almost unworked. At present, by far the greatest quantity of the sulphur employed in Europe comes from Sicily; and, as a general rule, it is abundant in volcanic districts. In the form of sulphide, sulphur occurs abundantly in combination with iron, copper (iron and copper pyrites), lead (galena), zinc (blende), etc., the bisulphide of iron (or iron pyrites) furnishing most of the sulphur that is employed in the manufacture of sulphuric acid. Sulphur is still more extensively distributed in the form of sulphates, the sulphates of lime, magnesia, baryta, etc., being abundant natural productions. In the vegetable kingdom, sulphur is a constituent (although only to a small amount) of the albuminous bodies which are so widely diffused in plants; and of certain volatile irritant oils, as those of mustard, garlic, asafetida, etc.; and, moreover, the vegetable juices contain it in the form of certain sulphates. In the animal kingdom, it is not only a constituent of the albuminous, fibrinous, and gelatinous tissues, but of the hair, saliva, bile, urine, etc. The two animal substances in which it is most abundant are cystin (q.v.), an occasional constituent of urinary calculi, and taurine (q.v.), a constituent of the bile, in both of which it forms a large fraction of the entire weight.

It would be out of place in this article to enter into details regarding the *extraction* or *preparation* of sulphur. It is sufficient to state that the grosser impurities are removed by crude processes of fusion and distillation at or near the place from whence it is obtained. That which is imported into America undergoes further purification. What is called *refined sulphur* is that purified by distillation in a large cast-iron still, and condensed in a receiver kept cool. When the vaporized sulphur is condensed in a large chamber, it is obtained in the form of *sublimed sulphur*, or *flowers of sulphur*; but as the walls get hot, it melts and collects on the floor, and is run into cylindrical wooden molds, from which, when cool, it is taken out as *roll* or *stick sulphur*. The residue left in the retort is a mixture of sulphur with various impurities. Under the names of *black*

sulphur, or *sulphur vivum* (commonly inquired for at the chemist's under the title of *sulphur of try*), it is used in veterinary medicine, and for the purpose of dressing moldy hops. Sulphur is thrown down from certain of its compounds (as from a strong solution of a polysulphide of calcium, sodium, or potassium) by dilute hydrochloric acid; it falls as a grayish-white, very fine, light powder, known in the *Materia Medica* as *milk of sulphur*, or *precipitated sulphur*. For the method of obtaining sulphur from iron pyrites, we must refer the reader to Miller's *Inorganic Chemistry*, 2d ed. p.154. The proceeding is usually conducted on a large scale, 2,000 tons of pyrites being roasted at once, the roasting extended over five or six months, and the final result being about 20 tons of sulphur. The most common impurities met with in ordinary commercial sulphur are selenium and realgar (bisulphide of arsenic). Flowers of sulphur frequently exhibit a slight acid reaction, in consequence of a little sulphurous acid clinging to them. By rinsing them with water, this impurity is at once removed.

Sulphur is extensively employed in the arts and manufactures; as in the manufacture of matches, gunpowder, etc. When converted into sulphurous acid, it is employed as a powerful bleaching agent, and also for the destruction of insects, fungi, etc.; but its chief consumption is in the manufacture of sulphuric acid.

Sulphur unites with oxygen in two proportions, *sulphur dioxide*, SO_2 , and *sulphur trioxide*, SO_3 . These are true acid-forming oxides, for when they are brought in contact with water they yield respectively *sulphurous* and *sulphuric acids*.

The following are the oxyacids of sulphur :

| | |
|---------------------------------------------------------------|------------------------------------|
| Hyposulphurous acid..... | H_2SO_3 . |
| Sulphurous acid..... | H_2SO_3 . |
| Sulphuric acid..... | H_2SO_4 . |
| Thiosulphuric acid (formerly called Hyposulphurous acid)..... | $\text{H}_2\text{S}_2\text{O}_3$. |
| Dithionic acid..... | $\text{H}_2\text{S}_2\text{O}_6$. |
| Trithionic acid..... | $\text{H}_2\text{S}_3\text{O}_6$. |
| Tetrathionic acid..... | $\text{H}_2\text{S}_4\text{O}_6$. |
| Pentathionic acid..... | $\text{H}_2\text{S}_5\text{O}_6$. |

The last five of these acids have never been obtained in the anhydrous form. We shall only notice the most important members of this group, viz., the second, third, and fourth, and of these, the third, *sulphuric acid*, is so extremely important, that it is discussed in a special article. The last four derive the essential portion of their name from the Greek word *theon*, sulphur.

SULPHUR DIOXIDE, or **SULPHUROUS ANHYDRIDE**, SO_2 , occurs under the ordinary relations of temperature and pressure as a colorless gas, possessing the suffocating odor of burning sulphur. In its concentrated form it is quite irrespirable, and in a diluted state it excites cough, and produces the symptoms of an ordinary catarrh. It is not only incapable of burning, but it rapidly extinguishes the flame of burning bodies. It is very freely soluble in cold water, which at 32°F . (0°C .) takes up nearly 69 times its volume of the gas, while at 68°F . (20°C .) it only takes up 36 volumes; the solution known as *aqueous sulphurous acid* having the same smell and taste as the gas. By the action of cold, sulphurous acid may be condensed to a colorless transparent limpid liquid, which has been solidified to a white, snow-like mass. The specific gravity of the gas is 2.247 (atmospheric air being the unit), and that of the liquid is 1.49 (water being the unit), the solid being considerably heavier. Although dry sulphurous acid gas and dry oxygen, when mixed, exert no action on one another, there are many conditions under which sulphurous acid rapidly absorbs oxygen, and is converted into sulphuric acid. This action takes place under the influence of hydrated nitric acid, iodic acid, and certain metallic oxides. For example, dioxide of lead, when immersed in the gas, burns, and is converted into white sulphate of lead, $\text{PbO}_2 + \text{SO}_2 = \text{PbSO}_4$. Hence, sulphurous acid is a powerful reducing or deoxidizing agent. This gas is a common and abundant product of volcanic action, and is occasionally met with in solution in the springs in volcanic regions. It may be prepared artificially by simply burning sulphur in the air or in oxygen gas, or by heating in a flask 4 parts of flowers of sulphur mixed with 5 parts of powdered black manganese, sulphurous acid and sulphide of manganese being the products, as shown by the equation $2\text{S} + \text{MnO}_2 = \text{SO}_2 + \text{MnS}$. In consequence of its solubility in water, this gas should be collected over mercury. In addition to the uses of sulphurous acid as a bleaching agent, it is valuable both as a disinfectant agent and as a powerful antiseptic; its latter property has been applied to the preservation of meat, which, after exposure to this acid, will keep fresh for years, if it be inclosed in metallic canisters filled with nitrogen, to which a little binoxide of nitrogen has been added, to remove any trace of oxygen. But by far its most important use is, as a first stage in the manufacture of sulphuric acid. In combination with bases, this acid forms the *sulphites*—a class of salts which, excepting the sulphite of soda, are of little practical importance, except for their power, when moist, of extracting oxygen, and thus acting as reducing agents. For example, the salts of the sesquioxide of iron are reduced by them to salts of the protoxide.

HYPOSULPHUROUS ACID, now called *Thiosulphuric Acid*, $\text{H}_2\text{S}_2\text{O}_3$, as yet is only known in a state of combination with bases; for on attempting to separate the acid from the

base, the former becomes decomposed into sulphur and sulphurous acid. The most important of its salts is the *hyposulphite of soda*, $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$, whose mode of preparation and characters are described in the article *SODIUM*. This and other soluble hyposulphites may be easily recognized by the facility with which they dissolve the haloid salts of silver, forming a solution of an extremely sweet taste, and containing a double hyposulphite of silver and soda, with an admixture of chloride, iodide, or bromide of sodium. It is this power of dissolving those salts of silver which are insoluble in water, that renders the hyposulphite of soda so important an agent in photography. The only other salt of this acid which we shall notice is the *hyposulphite of gold and soda*, $3\text{Na}_2\text{S}_2\text{O}_3 + \text{Au}_2\text{S}_2\text{O}_3 + 4\text{H}_2\text{O}$, which may be prepared by mixing concentrated solutions of 1 part of chloride of gold and 3 parts of hyposulphite of soda, and adding alcohol, when the required salt is precipitated. It is used for gilding the daguerreotype plate, and for toning the positive proof obtained in photographic printing.

With hydrogen, sulphur forms two compounds, viz., *sulphureted hydrogen*, or *hydrosulphuric acid* (q.v.), and *persulphide of hydrogen*, an oily liquid, having the smell and taste of sulphureted hydrogen, and in many of its properties having an analogy to binoxide of hydrogen. Sulphur combines with carbon to form a *bisulphide of carbon*, CS_2 , a very volatile colorless liquid, of a high refractive power, of an acrid and pungent taste, and a very disagreeable odor. It is heavier than water, in which it is insoluble, but dissolves freely in alcohol and ether, and is the best solvent for sulphur and phosphorus. Bisulphide of carbon does not occur as a natural product, but may be obtained by heating fragments of charcoal to bright redness in a porcelain tube, and passing sulphur vapor through it. Its vapor, when freely inhaled, exerts a similar anæsthetic action with those of chloroform and ether. Workmen in caoutchouc or other manufactures in which bisulphide of carbon is used as a solvent, suffer very much from prolonged exposure to its vapor, which produces headache, loss of appetite, impairment of vision and hearing, and causes general derangement of health by its deleterious action on the nervous system. Sulphur combines with chlorine in several proportions, the most important of these compounds being *monochloride of sulphur*, S_2Cl_2 , and the *dichloride of sulphur*, SCl_2 . Both of them are liquids, and are formed by the direct action of the combining elements. The monochloride is a yellow volatile liquid with a penetrating and disagreeable odor. When dropped in water, it sinks to the bottom (its spec. grav. being about 1.705), and is slowly decomposed into hydrochloric and sulphurous acids and free sulphur. It is capable of dissolving about 67 per cent. of sulphur at an ordinary temperature, and, like bisulphide of carbon, is extensively employed in vulcanizing india-rubber. The dichloride of sulphur is formed by saturating the monochloride with chlorine. It is a deep-red liquid, resembling the previous compound in most of its properties. It is decomposed by the sun's rays into the monochloride and free chlorine.

With regard to the history of sulphur and its compounds, it may be observed that sulphur seems to have been known from the earliest times, and that sulphuric acid was most probably known to the Arabians. The manufacture of English sulphuric acid dates, however, only from the 18th century. Sulphurous acid was first investigated by Stahl, Scheele, and Priestley; hyposulphuric acid was discovered by Welter and Gay-Lussac; hyposulphurous acid, by Gay-Lussac and Herschel; trithionic acid, by Langlois; tetrathionic acid, by Fordos and Gelis; and pentathionic acid, by Wackenroder. Scheele was the first who accurately studied hydrosulphuric acid, or sulphureted hydrogen.

Sulphur is used to a considerable extent and for very different purposes in medicine. It is given internally either as sublimed sulphur (flowers of sulphur) or as precipitated sulphur (milk of sulphur), in somewhat large doses, as a mild cathartic—its purgative effects being due to its stimulating the muscular coat of the intestines. In consequence of its being both gentle and sure in its action, it is the best purgative to employ in cases of piles, or in stricture or other painful affections of the rectum. The only objection to its use is that, from its becoming partly converted in the system into sulphureted hydrogen, the evacuations, and even the insensible perspiration, often become abominably fetid, and continue so for some time after the primary operation of the medicine. As a purgative, the dose is about two drams, made into an electuary with treacle or honey. It is, however, generally combined with jalap and cream of tartar.

The *confection of sulphur* of the *Pharmacopœia* is composed of sulphur, cream of tartar, and syrup of orange-peel rubbed together—the dose being from half an ounce to an ounce, or from one to two tablespoonfuls. In small doses, sulphur is of great value in cases of atonic gout and chronic rheumatism. An electuary known as the *Chelsea pensioner*, consisting of two ounces of sublimed sulphur, one ounce of powdered rhubarb, half an ounce of resin of guaiacum, one ounce of cream of tartar, half an ounce of ginger, and two drams of powdered nutmegs, with as much treacle as is necessary, in doses of one or two teaspoonfuls night and morning, is a combination of great value in these cases. It originally gained its reputation by curing lord Amherst of rheumatism, and is still a favorite remedy at Chelsea hospital. Dr. Neligan states that steaming the lower bowel, by sitting over the vapor of warm water upon which a tablespoonful of flowers of sulphur had been sprinkled, constitutes a most valuable remedy in what is popularly known as a "fit of the piles." The external use of sulphur in the form of

ointment has been already noticed in the article ITCII. It is also used externally in many other cutaneous disorders, particularly in lepra and psoriasis; and in chronic cases, its application in the form of vapor is often of great service.

SULPHURIC ACID, H_2SO_4 , is the chemical name of the liquid commercially and popularly known as *oil of vitriol*.* It is a monohydrate of sulphur trioxide, thus, $\text{SO}_3 \cdot \text{H}_2\text{O}$, and is a dense, colorless, oily liquid, without smell, of a spec. grav. of 1.846 at a temperature of 60°F . (15.5°C .), and of an intensely acid taste and reaction. It has a powerful caustic action, and chars and destroys organic matters from its strong affinity for water; and in consequence of this destructive property, it must always be handled with the greatest caution. So powerful is this affinity, that if the acid be exposed for a few days to the air in a shallow dish, so as to present a large surface, it often doubles its weight by absorbing aqueous vapor from the air; and in consequence of its possessing this property it is extensively used in laboratory operations as a desiccating agent. It mixes completely with water in all proportions, and as great heat is given out at the moment of mixture, the dilution should be performed by very gradually adding the acid to the water. When cold the mixture occupies less bulk than the two components previously occupied. This acid freezes at a temperature of -15°F . (-26°C .), and boils at 620°F . (326.5°C .) (or according to Marignac, at 640°F .), and just above the boiling-point it assumes the form of a vapor, with a spec. grav. of 2.15. Oil of vitriol, or the monohydrate, is not the only hydrate of sulphuric acid. Three others are known to exist. When the fuming oil of vitriol of Nordhausen is exposed to a low temperature, a white crystalline substance separates, which is a hydrate, containing half as much water as the common liquid acid. Its formula is $\text{H}_2\text{S}_2\text{O}_7$, or $(\text{SO}_3)_2\text{H}_2\text{O}$. Its fusing point is 95°F . (35°C .). Then, again, a mixture of 49 parts of strong liquid acid and 9 parts of water, $\text{SO}_3 \cdot 2\text{H}_2\text{O}$, freezes at 45°F . (7.2°C .), and crystallizes into splendid rhombic prisms, from which property it is often termed *glacial sulphuric acid*. It boils at 435°F . (224°C .), and its spec. grav. is 1.780. Lastly, when a very dilute acid is concentrated by evaporation *in vacuo*, at 212°F . (100°C .), till it ceases to lose weight, there will be a resulting compound, consisting of 40 parts of the real acid, and 27 of water, and represented by the formula, $\text{SO}_3 \cdot 3\text{H}_2\text{O}$. It boils at 348°F . (175.5°C .), and its spec. grav. is 1.602. There are thus no less than four hydrates of sulphuric acid—viz.: (1) the disulphuric monohydrate, $2\text{SO}_3 \cdot \text{H}_2\text{O}$; (2) the ordinary monohydrate, $\text{SO}_3 \cdot \text{H}_2\text{O}$; (3) the dihydrate, $\text{SO}_3 \cdot 2\text{H}_2\text{O}$; and (4) the trihydrate, $\text{SO}_3 \cdot 3\text{H}_2\text{O}$. The compound formerly known as *anhydrous sulphuric acid* possesses none of the characteristic properties of an acid. See SULPHURIC ANHYDRIDE; also CHEMISTRY.

Sulphuric acid in its free state is a very rare natural product; although, in combination with bases, it is common in the animal and vegetable, and abundant in the inorganic kingdom. It is known to occur free in certain American rivers, especially the Rio Vinagre, and some lakes in Tennessee and in Java; and it has been found to be a normal constituent of the saliva of *dolium galia*, a species of snail found in Sicily. In all these cases the acid is, of course, in an extremely diluted form. In plants it exists in the juices, and in animals in the blood and its derivatives chiefly in the form of sulphates of the alkalies; while in the mineral kingdom it occurs as gypsum (sulphate of lime), heavy spar (sulphate of baryta), celestine (sulphate of strontia), etc.

Sulphuric acid may be prepared on a small scale by boiling sulphur in *aqua regia*, or in nitric acid, the sulphur becoming gradually oxidized into sulphuric acid. As a general rule, however, the commercial acid is employed even for laboratory experiments.

In order to obtain the acid in a pure form, suitable for medical use or medico-legal analyses, it must be redistilled with sulphate of ammonia in a retort containing a few slips of platinum foil, the first and last portions being rejected. The distillation is attended with violent concussions, partly owing to the high specific gravity of the acid, and partly owing to its high boiling-point, and this convulsive action is moderated mechanically by the platinum slips. Sulphuric acid thus prepared according to the direction of the British pharmacopœia may be regarded as perfectly pure, presuming arsenic is not present. Strong sulphuric acid has comparatively little action on the metals except at a high temperature, when it dissolves them, and, at the same time, undergoes partial decomposition; the metal being oxidized by a portion of the acid which becomes decomposed into oxygen and sulphurous acid, and then uniting with a portion of undecomposed acid to form a sulphate. Silver, copper, mercury, arsenic, antimony, bismuth, tin, lead, and tellurium are thus acted on. Gold, platinum, rhodium, and iridium are not affected by the acid even at a boiling temperature. The more oxidizable metals, such as zinc, iron, nickel, and manganese, are readily soluble in the dilute acid, water being decomposed, and hydrogen liberated, while the oxygen of the water unites with the metal; and the metallic oxide, at the moment of its formation, combines with the sulphuric acid to form a sulphate.

The *sulphates*—or salts formed by the combination of sulphuric acid with a base—are generally composed, as in the case of green vitriol, $\text{FeSO}_4 + 7\text{H}_2\text{O}$, of 1 equivalent of acid and 1 of metallic oxide, with or without water of crystallization. With the alkalies this acid also forms acid salts, as bisulphate of potash, and in a few cases—copper,

* It received this name from having been first produced by the distillation of green vitriol (sulphate of iron); Basil Valentine being usually credited with the discovery. See ALCHEMY.

for example—it forms basic salts. The insoluble sulphates, such as that of baryta, may be obtained by precipitating a soluble salt of the base by a soluble sulphate; thus, nitrate of baryta and sulphate of soda yield an insoluble sulphate of baryta and nitrate of soda, which remains in solution. The soluble sulphates may be prepared by dissolving the oxide or carbonate in dilute sulphuric acid, in those cases in which the metal itself is not readily attacked by the acid. Sulphuric acid and the soluble sulphates are easily detected by their yielding, with a solution of a baryta salt, a white precipitate of sulphate of baryta insoluble in acids.

This acid is employed in the arts and manufactures for a large number of purposes. Its use as a desiccating agent for laboratory purposes has been already noticed, and its application to the development of oxygen gas has been described in the article on that element. But its greatest consumption, doubtless, is in the preparation of the *salt-cake*, which is used in the manufacture of carbonate of soda (q.v.).

In medicine a *dilute sulphuric acid*, formed by gradually mixing three fluid ounces of the strong purified acid with thirty-five fluid ounces of water, or *aromatic sulphuric acid* (known also as *elixir of vitriol*), prepared by mixing three ounces of sulphuric acid with a quart of rectified spirit, adding cinnamon and ginger, digesting for a week, and filtering, are almost always employed. In doses of from ten to thirty minims, properly diluted, these preparations exert a strong astringent power, and are serviceable in all forms of passive hemorrhages, and in checking inordinate discharges when they arise from debility. In ordinary diarrhoea, and even in the premonitory diarrhoea of cholera, dilute sulphuric acid is of great use. In painter's colic it is given in order to convert any lead that is absorbed into an insoluble sulphate, which is inert. Sulphuric acid lemonade is also used as a prophylactic against the disease. As this acid exerts a deleterious action on the teeth, it should be directed to suck it through a quill. In some cases it is prescribed not so much for its specific as for its solvent power; with this object it is usually prescribed with quinia. The strong acid is used in surgery as a caustic. In cases of *poisoning* with this acid the most prominent features are, burning pain extending from the mouth to the stomach, intense pain in the bowels, vomiting, great prostration, coldness of the surface, and fetor of the breath. The mucous membrane of the parts injured by the acid is at first converted into a white slough, which soon becomes black, and the patient usually dies from exhaustion within twenty-four hours. The best antidotes are the alkaline bicarbonates, or carbonate of magnesia. If the primary symptoms be conquered the patient often dies subsequently from stricture of the œsophagus.

Sulphuric Acid Manufacture.—There are two distinct processes by which sulphuric acid is at present prepared on a large scale—viz., by the distillation of green sulphate of iron—the original process of Valentine; and by the oxidation of sulphurous acid through the agency of nitrous acid and hyponitric acid. The first process is chiefly employed at Nordhausen, in Prussia, and is thus described by Fownes: "The sulphate of iron, derived from the oxidation of iron pyrites, is deprived by heat of the greater part of its water of crystallization, and subjected to a high heat in earthen retorts, to which receivers are added as soon as the acid begins to distill over. A part gets decomposed by the very high temperature; the remainder is driven off in vapor, which is condensed by the cold vessel containing a very small quantity of water or common sulphuric acid. The product is a brown oily liquid of about 1.89 specific gravity, fuming in the air, and very corrosive. It is chiefly used for the purpose of dissolving indigo."

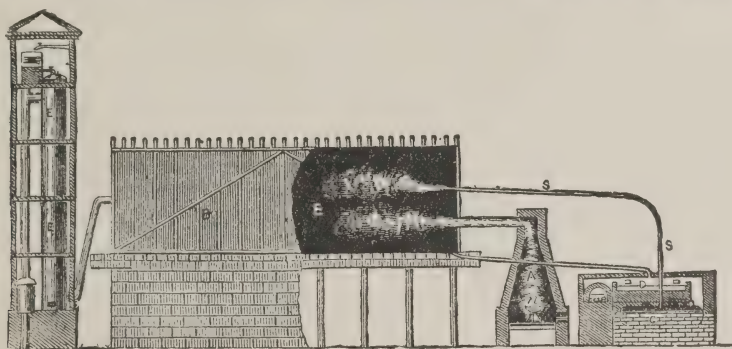
The second method is that universally followed in Great Britain, the germs of which were likewise discovered by Valentine. He observed that when the fumes of burning sulphur and niter were collected under a bell jar, slightly moistened with water, a small quantity of liquid was deposited. This liquid, which was simply sulphuric acid, on being concentrated from its solution by boiling, was long sold as oil of sulphur *per campanum* at prices as high as 2s. 6d. per ounce.

About the year 1740, the French chemists Lefevre and Lemery suggested that, by the use of niter along with the sulphur, the operation might be conducted in close vessels, and a much greater quantity of acid might be produced. This idea was acted on in England by a Dr. Ward, who established works at Twickenham and Richmond, conducting his manufacture by burning the mixed sulphur and niter in large stoppered glass receivers, into each of which a small quantity of water was first introduced. The substitution, by Dr. Roebuck of Birmingham, of lead chambers in place of glass vessels, may be regarded as essentially the establishment of the process of manufacture followed at the present day. Dr. Roebuck established his first works at Prestonpans in 1749.

The first stage in the manufacture of sulphuric acid is the preparation of sulphurous acid by the burning of sulphur or of iron pyrites. Previous to the year 1838, Sicilian sulphur was almost exclusively used in the manufacture, but in that year the very ill-advised establishment of a monopoly of the sulphur trade by the Sicilian government, and its consequent increase in price, diverted the minds of manufacturers to the employment of iron pyrites (sulphide of iron), the use of which, as a source of sulphurous acid, was already not unknown. The monopoly was quickly abolished, on the representations of the English government, but not until it was demonstrated that the world was independent of Sicily both for sulphuric acid and sulphur. Iron pyrites is now much more used than sulphur, and the only hindrance to its universal adoption

is the presence of foreign matter in the pyrites, the most deleterious being arsenical compounds; and it has hitherto been found impracticable to free the sulphuric acid wholly from the arsenious acid which consequently accompanies it. This renders the acid prepared from pyrites inapplicable for many purposes.

When sulphur is the material used for producing the sulphurous acid, it is burned in an oven or "burner" (A) of brick-work, having a sole or bottom of iron, termed the "burner-plate." Under this a small fire is at first lighted, which is allowed to go out after the sulphur has ignited. A little above the sulphur, a small pot, called the niter pot, *n*, is either placed on a stand or hung from the roof, filled with a quantity of either nitrate of soda or nitrate of potash, with sulphuric acid sufficient for its decomposition—8 or 10 lbs. of the niter, with 5 or 6 lbs. of sulphuric acid, being allowed for every cwt. of sulphur. The decomposition of the niter by the action of heated sulphuric acid furnishes nitric acid fumes, which go over into the chamber along with the sulphurous acid. The sulphurous acid readily abstracts from the nitric acid the additional equivalent of oxygen required for its conversion into sulphuric acid, reducing the nitrous compound from nitric acid, N_2O_5 , to nitrogen dioxide, N_2O_2 ; the reaction being thus: $3SO_2 + N_2O_5 = 3SO_3 + N_2O_2$. Nitrogen dioxide in its turn quickly converts itself into nitrogen tetroxide, N_2O_4 , by the abstraction of two additional equivalents of oxygen from the air that is constantly entering the chamber through the burners. Again, in the presence of moisture, which is supplied by a jet of steam from the boiler C, sulphurous acid readily deprives the nitrogen tetroxide of two equivalents of oxygen, and thus forms two more volumes of sulphuric acid, and again liberates nitrogen dioxide; which is ready once more to seize upon the oxygen of the air, and would continue so acting and reacting *ad infinitum*.



Manufacture of Sulphuric Acid:

A, sulphur-burner, or furnace; B, lead chamber, shown in section at B'; C, steam boiler; D, leaden pan; E, coke tower; S, steam-pipe; *n*, niter pot.

tum, were it not carried forward and out by the chimney provided for the escape of the freed nitrogen.

The chamber is an immense box or room of lead, bound together with a strong framework of timber, and generally raised on arches several feet above the ground. Chambers vary in size from 60 to 140 ft. in length, and from 20 to 40 ft. in width and height. Curtains of lead proceeding alternately from the bottom to near the top, and *vice versa*, are very frequently used; they serve to retard the progress of the gases, and thus insure the transformations desired. The floor of the chamber is covered with water, into which the sulphuric acid falls as it is formed: and when this solution attains a certain strength, it is tapped off for concentration. When the gases reach the chimney, on account of the reactions of the nitrous compounds already explained, a large amount of nitrous acid would not only be wasted, but would also be deleterious to the neighborhood, were steps for its recovery not adopted. This recovery is usually effected by means of a tower filled with coke, E, down which a constant stream of strong sulphuric acid trickles, the acid absorbing the nitrous fumes in their way upward. Instead of a single chamber, curtained off or not as the case may be, sometimes three or five distinct chambers, connected by pipes, are employed, those communicating directly with the burners being termed working chambers, and the others receiving chambers, the last either acting as or communicating with a condenser or chimney. In France and Germany, the apparatus employed is generally of a more complicated nature, but in principle the operations are identical.

When iron pyrites is used as the source of sulphurous acid, a furnace somewhat on the principle of the ordinary lime-kiln is required. The pyrites is broken into pieces like nuts, washed, and spread in layers on plates heated to redness, and frequently stirred; or a quantity of coke is introduced with the first charge; and the heat evolved by the burning sulphur is thereafter sufficient fuel for the fresh charges. The exhausted ore is frequently sufficiently rich in copper for its extraction; indeed, when there is not

more than $2\frac{1}{2}$ per cent of that metal present in pyrites, it is now recovered, and this has led to the establishment of copper smelting works in connection with great chemical works near Newcastle and Manchester. The use of pyrites necessitates a chamber of comparatively larger size for the production of a given amount than is required when sulphur is used. The increased labor, with the greater quantity of niter wasted, and other circumstances, tend to make the cost of acid from both sources nearly equal.

In consequence of strong sulphuric acid absorbing both sulphurous acid and nitrous acid, the acid requires to be drained off from the chamber while the solution is comparatively weak, at which strength, viz., of a specific gravity of about 1.55, it is used for some purposes in the arts, under the name of "chamber acid." This is concentrated by evaporating, in lead pans, D, till it reaches the specific gravity of 1.71, then boiling in a platinum retort, on which strong acid does not act, even at high heat, or in large flint-glass retorts. Platinum retorts are extremely expensive; one to hold 80 gallons costing nearly \$4500. Large glass retorts which were used before the introduction of the platinum retorts, are again coming into favor with manufacturers. The only objection to their use is the great expense arising from frequent breakages, and consequent loss of both acid and retort.

The manufacture of sulphuric acid is a very extensive industry; immense quantities of it being consumed in the manufacture of soda, in that of bleaching-powder, in calico printing and dyeing, and, in fact, in most chemical operations both in the manufactory and the laboratory. In South Lancashire alone upward of 700 tons of concentrated acid are produced weekly. A process of purification is required for the acid in several of its minor applications; but for general purposes, it is sufficiently pure as supplied by the works. See Lunge's *Manufacture of S. A. and the Alkalies* (1879-81).

SULPHURIC ANHYDRIDE, **SULPHUR TRIOXIDE**, also known as **ANHYDROUS SULPHURIC ACID**, is represented by the formula SO_3 . It forms colorless transparent prisms; its melting-point is 60.8°F. (16°C.) and its boiling-point 114.8°F. (46°C.). The specific gravity of the liquid is 1.97 at 68°F. (20°C.). It unites with moisture when exposed to the air, and gives off dense white fumes. When thrown into water, the heat emitted is so great that it hisses as red-hot iron would do; and the solution has all the properties of ordinary sulphuric acid. It may be obtained by the distillation of fuming Nordhausen acid, when white fumes pass over in the cooled receiver, and solidify into a white silky-looking fibrous mass. It may be also obtained by the distillation of acid sulphate of soda, NaHSO_4 , after it has been deprived of one molecule of water. It combines with sulphur, iodine, and hydrochloric acid; but both it and its compounds are of chemical interest rather than practical value. See **CHEMISTRY**. A sulphuric anhydride containing upwards of 80 per cent. of SO_3 , the remainder being H_2SO_4 , is now made on a large scale and sold under the name of *crystallizable sulphuric acid*. It is used for the production of certain artificial dyestuffs, such as alizarin, soluble indigo, etc.

SULPHURIC ETHER is a term commonly but improperly applied to ethylic, vinic, or ordinary ether (q.v.). True *sulphuric ether*, known also as *sulphate of ethyl*, $(\text{C}_2\text{H}_5)_2\text{SO}_4$, is an oily liquid, of burning taste and ethereal odor, resembling that of peppermint, of specific gravity 1.183 (while that of ordinary pure ether is 0.720), and almost incapable of being distilled without decomposition, as at a temperature of about 406.4°F. (208°C.) it resolves into alcohol, sulphurous acid, and olefiant gas.

In the article **ETHER**, reference is made to the anæsthetic properties of that compound. Dr. Richardson has discovered that local insensibility may be readily induced by the application to the skin of the finely divided spray of perfectly pure rectified ether of specific gravity 0.723. The skin blanches in from half a minute to two minutes; and by following the knife with the spray, more than merely superficial incisions may be rendered painless. It has been successfully employed in amputations of fingers and toes, removal of tumors, opening of abscesses, removal of teeth, etc.

SULPHUROUS ACID some years ago became one of the most popular articles in our pharmacopœia. This sudden popularity was mainly due to the researches of a Scottish provincial physician, Dr. Dewar, of Kirkcaldy, who, from beginning his experiments on cattle, during the period of the cattle plague of 1866, extended them to other animals and to man, and obtained remarkably satisfactory results (see *Medical Times and Gazette* for 1867, vol. i., pp. 492, 548). There is, of course, nothing new in applying sulphur-fumes—which in reality are composed of sulphurous acid gas—as a disinfectant. The classical scholar will recollect that Ulysses employed them to remove the unpleasant smell arising from the dead bodies of Penelope's murdered lovers. "Bring brimstone, the relief of evils," he exclaims, "and bring me fire that I may sulphurize the house."—Hom. *Od.* xx. 481, 482. It is also recorded by Ovid (*Fasti*, iv. 735) and other writers that the shepherds of Italy yearly purified their flocks and herds with "the blue smoke of burning sulphur." Professor Graham's remark, that of gaseous disinfectants, sulphurous acid (obtained by burning sulphur) is preferable on theoretical grounds to chlorine, and that no agent checks so effectually the first development of animal and vegetable life, may be said to contain all that was known with regard to the medicinal value of this gas, till Mr. Dewar began his investigations. In his experiments in connection with the cattle-plague he found that the most safe and convenient apparatus consists of a chafer two-thirds full of *red cinders*, a crucible inserted in the cinders, and

a piece of sulphur-stick. A piece of sulphur as large as a man's thumb will burn for nearly twenty minutes, and will suffice for a cowhouse containing six animals; and it appears undoubted that if there be due ventilation, this process may be performed four times a day for at least four months with positive advantage to the animals. When this system had been efficiently carried out—and it has been largely tried by his friends—no case of illness, not to say of death, occurred. In Mr. Crookes's report *On the Application of Disinfectants in arresting the Spread of the Cattle-plague*, that able chemist observed that "the value of sulphurous acid in arresting the progress of the cattle-plague has been proved beyond a doubt by the experiments of Dr. Dewar, and my own results entirely confirm his." His experiments in relation to the cattle-plague led Dr. Dewar to the further discovery of the value of sulphur fumigation in other departments of veterinary medicine. Peripneumonia, ringworm, mange, are among the diseases which rapidly disappear under its influence; and in the sudden undefined illnesses known in Scotland as "drows" and "towts," to which most of our domestic animals are liable, sulphurous fumigation, if applied at the outset, rarely fails to cut short the attack.

In medical practice there are three different forms, independently of the sulphites, in which sulphurous acid may be employed—viz.: (1) As the sulphurous acid of the British Pharmacopœia, which contains 9.2 per cent by weight, or about twenty times the volume of sulphurous acid gas dissolved in water; (2) in the form of spray, which escapes from the preceding compound under the action of an apparatus called a spray-producer; and (3) as a gas evolved by sprinkling at intervals small quantities of "flowers of sulphur" on red-hot cinders placed on a common shovel, resting on a stool in the middle of the room, or by burning bisulphide of carbon (*Lancet* for 1876, vol. ii, pp. 712, 811). A mixture of equal parts of sulphurous acid and water has been recommended in all cases of "breaches of the skin," as primary wounds (whether resulting from injuries or surgical operations), in ulcers, burns, bed-sores, chapped hands, chilblains, saddle-sores (whether of man or beast), sore nipples, and in cases of bruises, such as black eye, etc. Moreover, in erysipelas, its soothing properties, if diluted with two or three parts of water, are very striking. According to Dr. Dewar, the feverish irritability of young children is speedily relieved by dropping from time to time a few minims (5 to 30, according to age) of the acid on a few folds of muslin fastened on the breast: here, however, the action is not local, but is due to the evolution of the gas which is inhaled. Amongst the cases in which the acid is serviceable when applied in the form of spray or inhaled as gas, are asthma, bronchitis, catarrh, croup, diphtheria, facial neuralgia, laryngeal affections, phthisis (at all events as a palliative), scarlatina, and typhoid. Dr. Dewar ascribes the healing action of sulphurous acid to its power of destroying fungi. That the acid has this power, we freely admit, but we cannot so readily admit the correctness of his view that all the diseases in which he has found it serviceable (including piles and chilblains) are dependent on fungous growths. Dr. Dewar reports a case of severe sciatica, in which immediate and perfect relief was afforded by the injection of an ounce of sulphurous acid in a breakfast-cupful of gruel into the rectum. There is one affection of this class, to which Dr. Dewar does not refer, in which it has been prescribed with advantage—viz., the form of gastric disorder in which *sarcina* (q.v.) *ventriculi* occurs in the vomited matter, the dose being half a dram, largely diluted with water.

None of the *sulphites* or *hyposulphites* have as yet been introduced into the Pharmacopœia. We notice them here because their action is supposed to depend upon the liberation of sulphurous or hypo-sulphurous acid when the salt comes in contact with the acid juices of the stomach. It is mainly to Dr. Polli that we are indebted for the introduction of the sulphites and hyposulphites of the alkalies and alkaline earths (soda, potash, and magnesia) into medicine. From the year 1857 onwards he for several years devoted almost all his time to the study of these agents. His labors are briefly summed up as follows by Dr. Sanson in an excellent memoir on "The Germs of Cholera, and the Means of their Destruction," published Jan. 22, 1868, in the *Medical Press and Circular*: "It was found that animals could, without any apparent ill effects, swallow and absorb large doses of the sulphites. It was then observed that when the animals were killed, they long resisted the putrefactive process. Another series of experiments—and in this series 300 dogs were the basis of the deductions—showed that the sulphites exerted a prophylactic and curative power when septic poisons were introduced into the economy. Then, as regards the human subject, it was found that the stomach would tolerate large doses of the sulphites of soda or magnesia. They were tried in the various eruptive fevers, intermittent, diphtheria, typhus, typhoid, cholera, and choleraic diarrhœa, pyæmia, puerperal fever, dissection wounds, malarial infection, etc. The records of cases treated in this way show an extraordinary amount of success." In a paper published by Dr. Polli himself in *The British Medical Journal* for Nov. 16, 1867, he states that since the promulgation, in 1861, of his views regarding the therapeutic value of the sulphites, no less than 158 papers on the subject have appeared; and with the exception of five or six containing certain criticisms on his labors, "all the remainder confirm, in the strongest terms, by many hundreds of detailed observations, the value of these remedies." A scruple of the salt dissolved in a wine-glassful of water flavored with tincture of orange-peel is the average dose, and it should be taken every four hours; and in some cases, as in typhoid, a grain of quinine may be advantageously added to each dose. M. de

Ricci (*Dublin Quarterly Journal*, Nov., 1866) prefers the sulphite of magnesia on the grounds that it is less unpalatable, and contains a larger proportional quantity of acid, than the soda salt. The remarkable results obtained by Dr. Dewar have not been paralleled in the experience of other physicians, but the acid is recognized as a valuable remedy, in many diseases, especially those caused by parasites.

In consequence of the powerful antiseptic properties of sulphurous acid, either in the form of gas or gaseous solution in water, and of the sulphites, these substances have been employed for the purpose of preserving meat from putrefaction. A joint of meat or a fowl submitted to a daily sulphur fumigation may be kept fit for use for many weeks. The bisulphite of lime has been found to be the most applicable of the various compounds of this class as a preservative; and Messrs. Medlock and Bailey have patented a method of preserving meat by means of a preparation of this salt. In hot weather a few drops of a strong solution of this salt will serve to keep fresh a pint of soup, jelly, milk, etc. Dr. Dewar patented a method of preserving meats by sulphurous acid, or some of its compounds; but as yet the process has not come into extensive use.

SULPICIANs, a society of priests formed in 1641 by Jean Jacques Olier for the purpose of educating priests, and deriving its name from the parish of St. Sulpice in Paris, of which he was pastor a year later. When their number had increased, a part assisted the pastor, and others took charge of a seminary. The priests of this society have conducted seminaries in France and some in America. Their institutions in France were suspended in the revolution, but in 1816 restored. Some of their members, as Olier, J. A. Emery, and Carrière have been distinguished as theologians.

SULTAN, or **SULTAUN**, an Arabic word, signifying "mighty man," and evidently closely connected with the Hebrew word *shalal*, to rule, is in the east an ordinary title of Mohammedan princes, and also used in private life as a title of courtesy for people of high rank. It is given, *par excellence*, to the ruler of Turkey, who assumes the title sultan-es-selatin, or sultan of sultans. It is also applied to his mother and daughters; the word in Turkish having no grammatical gender, and corresponding also to our princess. The wife of the sultan is not now entitled to the epithet sultan or sultana.

SULU ISLANDS, an archipelago of above 60 small and rocky, yet fruitful islands in the Mindoro sea, between the Philippines and Borneo (q. v.). Cagayan Sulu, the chief of the islands, 36 m. long and 12 broad, contains the town of Soong, the residence of the sultan of the group. Pop. '87, 104,015. See **PHILIPPINE ISLANDS**.

SUMACH, *Rhus*, a genus of small trees and shrubs, of the natural order *anacardiaceæ*; having small inconspicuous flowers in panicles or in corymbs; a 5-parted calyx, 5 petals, springing from beneath a large orbicular disk; 5 stamens; a 1-celled germen with 3 stigmas; the fruit a small, nearly dry drupe, with bony *putamen*. The species are numerous, diffused over almost all parts of the world, except its coldest regions and Australia; and some of them, on account of peculiar principles which they contain, are of importance in the arts and in medicine; some are remarkable for their poisonous properties.—**VENETIAN SUMACH** (*R. cotinus*), known also as wig sumach or wig tree, is a native of the s. of Europe and w. of Asia, and is often planted in Britain as an ornamental shrub. It has simple leaves, and hairy corymbs of fruit, which have a sort of resemblance to periwigs. The wood dyes yellow; and, with the addition of other substances, green and brown, and is known in trade by the name of *young fustic*. It is largely imported into Britain. The bark is sometimes used as a substitute for Peruvian bark. The leaves are astringent, and are used for dyeing Turkey red. The root is also used in dyeing, and the whole plant is used in Italy for tanning, and is there called *scotino*. The seed resembles the almond in flavor.—The very acid fruit of the **ELM-LEAVED SUMACH** (*R. coriaria*)—a native of the countries around the Mediterranean, with pinnate leaves, not unfrequent in British shrubberies—has been used from the earliest times, as it still is by the Turks and Persians, as a condiment with different kinds of food. Both the seeds and the leaves are used medicinally, in the s. of Europe and the e. as tonic and cooling. This species is also extensively used for tanning, particularly in Turkey and in Spain. The leaves and twigs are used for dyeing black, the roots and fruit for dyeing red, and the bark for dyeing yellow.—Similar to this in its properties and uses is the **VIRGINIAN SUMACH**, or **STAG'S-HORN SUMACH** (*R. typhina*), a native of almost all parts of North America, and common in British shrubberies, which has the branches curiously crooked, and covered, when young, with a soft velvety down. It has pinnate leaves, with numerous leaflets.—The **SMOOTH-LEAVED SUMACH** (*R. glabra*), a very similar species, also North American, has very acid leaves, which are eaten by children, and are used in domestic economy and in medicine on account of the malic acid which they contain. The bloom of the fruit is also very acid. This species is sometimes troublesome in North America, overrunning ground as a weed.—Of the acrid and poisonous species, the most important is the **POISON OAK** (*R. toxicodendron*) of North America, a shrub from 1 to 3 ft. high, with leaves of 3 leaflets, and a milky juice, which becomes black on exposure to air. The leaves are used in medicine in cases of paralysis, amaurosis, and other nervous affections, as a stimulant of the nervous system, also in chronic rheumatism and obstinate eruptions; but are efficacious only when fresh, as the poisonous substance is volatile. Similar to this in properties are the **POISON IVY**, or **POISON VINE** (*R. radicans*), the **POISON ALDER**, **POISON SUMACH**, or **SWAMP SUMACH** (*R. venenata*), also known as dog-

wood, and other North American species, the juice of which is very acrid, and even the emanations are injurious to some persons, who from remaining a short time near these plants, or from handling them, experience swelling of the whole body, with subsequent inflammation of the skin, pustules, and violent itching, while it is remarkable that others appear quite unsusceptible of their influence.—The VARNISH SUMACH or JAPAN VARNISH TREE (*R. verniceifera*), a native of Japan and Nepal, yields a varnish much used in Japan for lacquer-work. This varnish is the juice which flows from wounds in the tree, and which becomes thick and black by exposure to the air, but is still so transparent that the finest veins of wood varnished with it may be seen through it. It is sometimes mixed with coloring matters, sometimes with gold-leaf finely ground. The expressed oil of the seeds becomes as hard as tallow, and is used for candles.

The name TANNERS' SUMACH is given to *coriaria myrtifolia*, a shrub of the s. of Europe, of the natural order *Ulmaceæ*. The leaves are astringent, and are used for tanning, and for dyeing black.

SUMATRA (called by the Arabians *Srimat* or *Srimata*, "the happy," whence its present name), the most westerly of the Sunda islands, lies s. of the Malay peninsula, from which it is separated by the strait of Malacca. Lat. between $5^{\circ} 45' \text{ n.}$ and $5^{\circ} 50' \text{ south.}$ It is 1040 m. long and 266 m. in extreme breadth; area, 168,000 sq. m.; population estimated at about 4,000,000. The following table, taken from the *Statesman's Year-book* for 1897, gives the area of each district into which the island is divided and the estimated population at the end of 1894.

| | Area in Sq. Miles. | Population, 1894. |
|----------------------|--------------------|-------------------|
| West Coast..... | 31,649 | 1,275,585 |
| East Coast..... | 35,312 | 304,990 |
| Bencoolen..... | 9,399 | 160,508 |
| Lanpongs..... | 11,284 | 135,194 |
| Palembang..... | 53,497 | 694,613 |
| Acheen or Atjeh..... | 20,471 | 447,684 |
| Total..... | 161,612 | 3,018,574 |

These estimates are only approximate. Another estimate places the number of inhabitants of the districts wholly under Dutch control at 3,090,301. The others, numbering about 1,000,000, still retain their independence in spite of the efforts of the Dutch to enforce their rule over them. The independent natives reside chiefly in the so-called kingdom of Acheen, where the Dutch for many years have encountered serious opposition. The Europeans in 1891 numbered 4,953, the Chinese, 95,000, and the Arabs, 2,854. The chief cities are Padang and Bencoolen on the western coast and Palembang on the eastern coast.

Physical Features.—The Barisan mountains run throughout its entire length, varying in altitude from 1550 ft. in the s.w. to 6,000 under the equator. Lofty cones, of which about 20 are volcanoes, attain to from 6,000 to upward of 10,000 feet. Another series of mountains runs parallel with the Barisan, lofty plateaus of great extent linking them together at various points. On the w. coast, a few m. of low land lie between the mountains and the sea, in some parts spurs reaching the shore in beetling cliffs. Wide alluvial plains, covered with dense jungle and forest, through which the rivers run sluggishly, forming deltas at their mouths, stretch along the n.e. coast; while the tidal action is eating into the w. coast, new ground is forming on the east. Extensive valleys lie between the mountain chains. Several beautiful lakes are scattered over the interior. The largest is lake Singkarak or Samawang, in upper Padang, 17 m. long and 6 broad.

The mountain systems are of trachyte, granite, limestone, red sandstone, and a widespread conglomerate composed of granitic and quartzose particles, the hollows in many places being filled with lava. Sienite, porphyry, serpentine, jasper, basalt, and tufa occur. Tertiary deposits are found in the valleys, and in some parts of the coasts a rich vegetable mold rests on beds of red and gray clay, or on coralline limestone. Potter's clays are met with, and gold is widely diffused. Coal, iron ore, copper, sulphur, lead, silver, saltpetre, alum, naphtha, etc., abound.

Rivers.—Sumatra has many rivers, the most important being the Tulang-Bawang; the Mûsi, or river of Palembang; the Djambi, Indragiri, and Siak, on the e.; the Singkel, Tabûjong, Indrapûra, Moko-Moko, Bencoolen, and Padang Gûtjie on the west. The capes and bays are numerous, the bay of Tapanûli being capable of containing a large fleet. A chain of islands lies parallel to Sumatra in the Indian sea. The most important are—Babi or Si Malu, Nias (q. v.), the Batû islands, North Pora, Coco island, South Pora, North Pagei, and South Pagei. To the s.e. lies Banca, rich in tin, producing also iron, lead, silver, copper, arsenic, and amber.

Climate.—The climate of Sumatra is moderately healthy, especially on the e. coast. In Tapanûli, however, are large marshes, inducing intermittent and typhoidal fevers, dysentery, and other diseases. A slight increase of temperature takes place from October to March, the minimum being in May. The monsoons are irregular, and rain falls during all the months, though the quantity in October and December is double that in February and June.

Flora.—Sumatra has many fine species of timber trees—as the djati (*tectona grandis*), the maris, a hard and heavy wood, ebony, iron-wood, etc. The magnificent *dryobalanops camphora*, and other resin-producing trees, are abundant. Several species of fig, the *urceola elastica*, from which caoutchouc is obtained, and the gutta-percha tree (*isonandra gutta*), are numerous. In the villages the bombax, or silk-cotton tree, forms a shady resting-place at noon. The lovely *cinnamomum cassia*, the *melaleuca leucadendron*, which yields the medicinal cajuput oil, the satin-wood (*chloroxylon swietenia*), the gigantic reed (*calamus draco*), from the ripe fruit of which the dragon-blood gum exudes, and a great variety of palms, form part of the botanical wealth of the island. Flowering plants and shrubs are numerous, and countless parasites garland the forest trees with flowers of every hue. The most curious of these is the *rafflesia* (q.v.), which, clinging to the bark of large trees, spreads out the largest known flower, with a calyx 3 ft. in diameter and 9 in. deep, and capable of containing 2 gallons of fluid.

The fruits are richer in flavor than those of Java. Among these are the guava, citron, oranges, lemon, durian, mango, bread-fruit, cocoa-nut, pomegranate, water-melons, pine-apples, and the highly-prized mangosteen, or berry of *garcinia mangostana*. Cacao, cotton, maize, indigo, tobacco, gambier, and more especially rice, millet, pepper, and coffee, are cultivated.

Fauna.—The elephant, single and double horned rhinoceros, tiger, leopard, black bear, and tiger-cat, wild-swine, tapirs, antelopes, deer, monkeys (including the ourang-outang), ant-eaters, many kinds of bat, etc., abound. Buffaloes, cows, goats, horses, sheep, and swine are kept by the natives. The peacock and the pheasants of Sumatra are of rare beauty. Hippopotami and crocodiles frequent the rivers, which have many kinds of fish, including a species of salmon.

People.—The natives are chiefly Malays who profess Mohammedanism. In appearance, manners, and customs, however, the inhabitants of Acheen and the Lampongs differ widely from those of other parts. The Acheenese are tall, well-made, active, and intelligent, but cunning, proud, treacherous, and blood-thirsty. They live simply, but are slaves to opium. The Lampongs are of middle stature, well-formed, of pleasant exterior, mild, but uncivilized and lazy. Caste prevails, and they follow the usages of their fathers, Mohammedanism being imperfectly known and practiced. Polygamy obtains, the wives being bought from their relatives. The houses are on posts of iron-wood, several families living under the same roof. In other parts of Sumatra the usual Malay type is found. The Kūbūs, in the n.w. of Palembang, are probably the remains of the aborigines, a harmless race who live chiefly by the chase and fishing. Theft and murder are scarcely known among them. They believe in an after spirit-life.

Trade and Produce.—There is a considerable trade in indigo, cotton, tobacco, maize, and rice. Teak-wood occurs in the forests, and coffee is raised in some parts of the island. The chief occupations are agriculture and shipping. In earlier times piracy was practiced extensively by the inhabitants. The principal industries are the weaving of cotton cloth and the working of gold. Tobacco has become an important product and is exported in considerable quantities, being highly valued for wrapping purposes. Much of it finds its way to the United States and at one time it was estimated that one-third of the entire tobacco crop was taken by the latter country. The influx of Sumatran tobacco was so great as to occasion alarm to the United States seed-leaf growers, and a very high duty was levied upon it in the McKinley tariff, not, however, with the result of preventing the importation, which in two years, became as extensive as it ever had been. The importance of the Sumatran tobacco as an article of commerce was pointed out in 1862 to a trading company in Batavia, and from that time on, the trade was rapidly developed. The island contains a fair supply of minerals, but its resources in this respect have not been developed. The chief minerals are gold, copper, iron, lead, coal, and petroleum.

History.—Marco Polo visited Sumatra in the 13th c., Alvaro Talezo in 1506, and Siquera in 1509, the Portuguese then entering into trading relations with the natives. About 90 years later the Dutch under Houtman reached the island, and on a second visit he was treacherously murdered at Acheen. In 1601 two ships from Zealand, with the Netherlands commissioners, Gen. De Roi and Laurens Bikker, arrived; were favorably received by the king, obtained a full cargo, and returned with two Acheenese ambassadors. Later, the Dutch drove the Portuguese from their factory at Pulū Tjinko, to the s. of Padang; and in 1666 the latter place became the seat of the Netherlands power on the w. coast. In 1795 Padang was taken by the British, and retained till 1819. A few years after, Bencoolen was also given up to the Dutch, and the southern division of the island soon fell under the same rule. Various rebellions against the Netherlands dominion have since arisen, with the uniform result of extending the power of the Dutch toward the interior and the north. The appalling eruption of 1883 at the volcanic island of Krakatoa, between Sumatra and Java, raised a vast sea wave which swept destructively the southern shore of S., and raised a new line of volcanic cones in the straits of Sunday. For an account of the wars between the Dutch and the natives of Acheen, see the article NETHERLANDS. See also *Flora van Nederlandsch-Indië*, by F. A. W. Miquel (Amst. and Leip., 1855); *The Malay Archipelago*, by A. R. Wallace (1869); *Australasia*, by A. R. Wallace (1880); and for a map of the island, Dornseiffen and De Geest, *Sumatra, Bangka en der Rioult-Lingga-Archipel* (1892).

SUMBAWA, one of the chain of islands to the e. of Java, lies between 8° 4' and 9° 2' s. lat., and 116° 50' to 119° 15' e. long., is now divided into the kingdoms of Sumbawa,

Bima, Dampo, Mangherai, and Sangar, governed by separate sovereigns, and owing allegiance to the Netherlands. The seat of the Dutch resident governor is at Bima. Area, 5,838 sq. miles. Pop. nearly 100,000. The island is mountainous, but except the volcano Tambora, which is 9,522 ft., the elevation does not exceed 5,660. The most valuable timber-tree is the djati (*tectona grandis*, or Indian teak), and the tamarind is so abundant as to be little valued. Rice is extensively grown. Sapan-wood is contracted for with the princes, by the Netherlands colonial government. Pop. about 150,000.

In 1815 an eruption of Tambora depopulated the kingdoms of Tambora and Papekat, 42,000 lives being lost, and great damage done to the whole island by the ashes. Another took place in 1836, and one of Gunong Api, in Bima, in 1860, but with little loss.

SUM'BUL (see MUSK PLANT) has been extensively employed for some years past, both in this country and in Gt. Britain in the treatment of epilepsy, hysteria, and other diseases of the nervous system. It has a musk-like odor, and an aromatic and somewhat bitter taste. It may be given in the form of infusion, tincture, or resin.

SUMMARY DILIGENCE, in the practice of the law of Scotland, means issuing execution without the formality of an action, as a creditor enforcing payment of a bill of exchange or of a bond.

SUMMER, a horizontal beam, called also breast summer.

SUMMER DUCK, or WOOD DUCK, *Dendronessa sponsa*, or *aix sponsa*, a very beautiful species of duck, of the section having the hind-toe destitute of membrane, a native of North America. It is found during the breeding season in almost all parts of the United States, and as far n. as Nova Scotia, migrating southward in winter, when it abounds in Texas and Mexico, but some remain during winter even in Massachusetts. It has been found capable of domestication.—Very similar to it is the MANDARIN DUCK (*dendronessa* or *aix galericulata*), a Chinese species. Both of these species have the power of perching on trees. The summer duck makes its nest in the hollow of a tree.

SUMMERFIELD, JOHN, 1798-1825; b. England; educated at the Fairfield Moravian seminary; was a clerk at 14 in a mercantile house in Liverpool, and fell into bad habits; went with the family to Dublin in 1813; joined the Wesleyans; became a preacher in the Irish conference, 1818; preached with eloquence and success in Ireland and England; came to America with his father, 1820, and joined the New York conference. In New York, Philadelphia, Baltimore, and Washington, his remarkable eloquence drew immense crowds from all denominations, classes, and professions. His health failing under his excessive labors he sailed for France in 1822; represented in Paris the American Bible society to the French Protestant Bible society; spent some time in England; returned to New York, 1824, and continued to travel and preach, though in feeble health. He aided in forming the American tract society. His *Sermons* and *Sketches of Sermons* were published, with a biography by John Holland.

SUMMER ISLANDS, a small archipelago of islets off the w. coast of Scotland, near the entrance of loch Broom, an inlet in the n.w. of the county of Ross. The islets are about 20 in number; and the largest of them, Tanera, 2 m. long, and 1 m. broad, has a pop. of 119.

SUMMERS, a co. in s. West Virginia, drained by the Greenbrier and Kanawha rivers and traversed by the Chesapeake and Ohio railroad; formed in 1871 from four other cos.; pop. '90, 13,117, chiefly of American birth, with colored. The surface is rough and hilly, fertile only in the bottom lands; corn, wheat, and cattle are the staples. Area, 400 sq. m. Co. seat, Hinton.

SUMMERS, THOMAS OSMOND, D.D., LL.D., b. England, 1812; came to America, 1830; joined the Methodist Episcopal church, 1832; received into the Baltimore conference, 1835; missionary to the republic of Texas, 1840, and was one of the nine preachers who formed the first Texas conference; became a member of the Alabama conference, 1844; was secretary of the conference at Louisville, Ky., where the Methodist Episcopal church, South, was organized. Dr. S. published *A Treatise on Baptism; A Treatise on Holiness; Sunday-school Teacher, or the Catechetical Office; Seasons, Months, and Days; Talks Pleasant and Profitable; The Golden Censer; Scripture Cathecism*, 2 vols.; *Questions on Genesis; Refutation of the Theological Works of Thomas Paine*. He was appointed in 1846 assistant editor of *The Southern Christian Advocate*; edited *The Sunday-school Visitor* for seven years, and *The Quarterly Review* of the Methodist Episcopal church, South, in 1858; was chairman of the committee appointed to prepare the new hymn book, and edited nearly all the publications of the Southern Methodist church. He d. 1882.

SUMMIT, a co. in central Colorado, crossed by the Rocky mountains; intersected by the Denver, Leadville, and Gunnison railroad; 690 sq. m.; pop. '90, 1906. There are large deposits of gold, iron, coal, lead, copper, and zinc. Co seat, Breckinridge.

SUMMIT, a co. in n.e. Ohio, drained by the head-waters of Tuscarawas river and the Cuyahoga; 391 sq. m.; pop. '90, 54,088, chiefly of American birth, with colored. It is intersected by the Ohio and Erie canal, here at its highest elevation, and by the Baltimore and Ohio, the Cleveland, Akron, and Columbus, the Erie, the Northern Ohio and Valley, and other railroads. Its surface is hilly, diversified by lakes, and contains the long narrow valley of the Cuyahoga, 300 ft. deep. The streams furnish extensive water-power; there is a good supply of timber; rich coal beds are mined; there are sandstone and fire clay. Large numbers of sheep and other stock are raised, and the

soil produces grain, and dairy products. The manufactures are important, embracing carriages, cooperage, lumber, leather, cutlery and edged tools, machinery, paper, iron castings, etc. Co. seat, Akron.

SUMMIT, a co. in n.e. Utah, bordering on Wyoming; crossed by the Wasatch mountains, whose plateau is 11,000 ft. above sea-level; 3062 sq. m.; pop. '90, 7733. The surface is covered with vast forests. It has large deposits of gold, silver, lead, and coal. Co. seat, Coalville.

SUMMONS, in American law, means generally a writ directed to a party to appear and answer some complaint before a court or judge. It is the first writ in an action at law; and a similar writ issues incidentally both in chancery and interlocutory matters. It is also the first step in proceedings before justices. In England it is also the first writ in an action.

SUMNER, a co. in s. Kansas, having the territorial line of Oklahoma for its s. boundary; 1188 sq. m.; pop. '90, 30,271, chiefly of American birth, with colored. It is drained by Arkansas river, Good river, and Cowskin and Slate creeks. The surface is level prairie, containing every element of fertility. Co. seat, Wellington.

SUMNER, a co. in n. Central Tennessee, adjoining Kentucky; drained by branches of the Big Barren and Cumberland, by which it is bounded s.; traversed by the Louisville and Nashville and the Chesapeake and Nashville railroads; 536 sq. m.; pop. '90, 23,668. The surface is heavily wooded and elsewhere fertile; tobacco, corn, wheat, oats, and pork are the staples. Co. seat, Gallatin.

SUMNER, CHARLES, statesman, oldest son of Charles Pinckney Sumner and Relief Jacobs Sumner, was born in Boston, Mass., Jan. 6, 1811. The Sumners, several of whom were Harvard graduates, were a prominent family in early Massachusetts history. One, Increase Sumner, was governor from 1797-99. Charles's father, a scholarly man, was a fine lawyer, and for many years sheriff of Suffolk Co. Josiah Quincy said of him: "He is the only sheriff, except Walter Scott, born on Parnassus." The Sumners were noted for both physical and intellectual vigor, and Charles was tall, broad-shouldered, and of commanding presence, and so remarkable was his memory that he was known as the best historical student of his time. He graduated from Harvard in 1830, studied law with Judge Story, and was admitted to the bar in 1834. The Judge formed a deep attachment for him, and appointed him Reporter of his court. While in this position, he published three volumes of Story's decisions, known as *Sumner's Reports*, which made him well known in England. He frequently supplied Story's place as lecturer at the law school, and was himself a lecturer there from 1835-37, and again in 1843. In 1837-40 he visited Europe, where he was the recipient of much flattering attention. On his return he, with J. C. Perkins, edited *Vesey's Reports*, with annotations, in twenty volumes. In 1845 he delivered the Fourth of July oration in Boston on *The True Grandeur of Nations*, of which Cobden said: "It is the noblest contribution ever made by any modern writer to the cause of peace." But it gave offense to the leaders of the Whig party, which was further deepened by the stand he took on the admission of Texas, and eventually led to his entire withdrawal from that party, and his association with the Free-Soilers. In 1846 he delivered another powerful speech on "Our Present Anti-Slavery Duties," which gave such offense to the circle in which he moved, as to almost crush him both socially and professionally. Although keenly sensitive to this change of public sentiment, he never for an instant wavered from his championship of the right as God gave him to see the right. In 1852 he presented a memorial against the Fugitive Slave Bill. The majority were determined he should not deliver a speech he was known to have prepared on the subject; but he watched his opportunity, and in August, being entitled to the floor, held it against all opposition for over four hours. His theme was "Freedom National, Slavery Sectional," and this phrase became a watchword of the party. In 1856 he made one of his ablest speeches on "The Crime against Kansas," some portions of which so incensed the southern members, that Preston S. Brooks (q.v.), of South Carolina, assaulted him, and the injuries proved so serious that he was abroad for medical treatment much of the time for four years. In 1859 he resumed his seat, and in 1860 became one of the most prominent leaders of the Republican party. His speeches, which were on all topics of national importance, were always powerful and had great influence with the public. Among these may be noticed the speech against the seizure of Mason and Slidell, on "Our Foreign Relations," on "The Case of the Florida," and his "Eulogy on President Lincoln." Later, he took an active part in all anti-slavery legislation, in reconstruction measures and in the impeachment of President Johnson, while his speech in reference to the Alabama Claims caused great indignation and much criticism among all his English friends. In 1869 he opposed the Santo Domingo treaty, which brought him in collision with the administration, and led ultimately to his separation from the Republican party, and his support of Horace Greeley for president in 1872. The last efforts of his life were his resolution that "the names of victories in the civil war should not be inscribed on regimental flags," and his Civil Rights bill, giving equal rights to white and black in every state in the Union, so far as personal rights under the law were concerned. It was thought he never recovered from the attack made on him by Mr. Brooks in 1856; and in 1874 this trouble returned to him in a serious malady of the chest, which proved fatal on March 11. Almost his last words were to Judge Hoar: "Take care of my Civil

Rights Bill." See Lester, *Life of Sumner*; *Orations and Speeches*; and *Complete Works*, a collection prepared by himself (twelve volumes, Boston, 1871-75).

SUMNER, EDWIN VOSE, 1797-1862; b. Boston; appointed to the army in 1819; served in the Black Hawk war on the Indian frontier, and through the Mexican war. He was dangerously wounded at Cerro Gordo, where he led the charge, and was brevetted colonel for his conduct at Molino del Rey, where he was in command of the cavalry. He was governor of New Mexico, 1851-53; led an expedition against the Cheyennes in 1857; and in 1861 succeeded Twiggs as brig. gen., and assumed command of the department of the Pacific. He was soon recalled to the e., and taking command of the 1st corps of the army of the Potomac, served through the peninsular campaign of 1862, in which he was twice wounded. The same year he became maj. gen. of volunteers, and took command of the 2d corps. He was at Fredericksburg, and early in the next year was ordered to take command of the department of the Missouri, but died on his way.

SUMNER, WILLIAM GRAHAM, born Paterson, N. J., 1840. He graduated at Yale coll. in 1863; 1863-66 studied in Germany and England; afterwards entered the ministry of the Prot. Epis. church, and was assist. minister of Calvary church, New York. In 1872 he was appointed prof. of political and social science in Yale coll. He is the author of *History of American Currency*, *Andrew Jackson as a Public Man*, and *Lectures on the History of Protection in the United States*, *The Financier and Finances of the American Revolution* (1891). He is a well known and ardent champion of free trade, and both as a college teacher and as a public lecturer on his favorite theme, he has drawn wide attention by the keenness of his argument, the clearness of his style, and the uncompromising quality of his statements.

SUMPTUARY LAWS (Lat. *sumtus*, expense), laws passed to prevent extravagance in banquets, dress, and private expenditure. They abound in ancient legislation. The Locrian legislator, Zaleucus, 450 B.C., ordained that no woman should appear in the streets attended by more than one maid-servant, unless she were drunk, or wear gold or embroidered apparel, unless she designed to act unchastely. At an early period in Roman history, the censors, to whom was intrusted the superintendence of public and private morality, punished with the *notatio censoria* all persons guilty of luxurious living; but as the love of luxury grew with the increase of wealth and foreign conquest, various legislative enactments were passed with the object of restraining it. The *lex Orchia*, 161 B.C., limited the number of guests to be present at a feast; the *lex Fannia*, 161 B.C., regulated the cost of entertainments, enacting that the utmost sum which should be expended on certain festivals was to be 100 asses, 30 asses on certain other festivals, and 10 asses on an ordinary entertainment, where also no other fowl than one hen was permitted to be served up, and that not fattened for the purpose. There were also the *lex Didia*, *Lucretia*, *Cornelia*, *Æmilia*, *Antia*, *Julia*, and others, most of them passed in consequence of the practical disregard of the similar laws that had preceded them; but they all seem to have been habitually transgressed in the later times of the republic.

Sumptuary laws were in great favor in the legislation of England from the time of Edward III. down to the reformation. Statute 10 Edward III., c. 3, narrates that "through the excessive and over-many costly meats which the people of this realm have used more than elsewhere, many mischiefs have happened; for the great men by these excesses have been sore grieved, and the lesser people, who only endeavor to imitate the great ones in such sorts of meat, are much impoverished, whereby they are not able to aid themselves, nor their liege lord, in time of need, as they ought, and many other evils have happened as well to their souls as their bodies;" and enacts that no man, of whatever condition or estate, shall be allowed more than two courses at dinner or supper, or more than two kinds of food in each course, except on the principal festivals of the year, when three courses at the utmost are to be allowed. All who did not enjoy a free estate of £100 per annum were prohibited from wearing furs, skins, or silk, and the use of foreign cloth was allowed to the royal family alone. Act 37 Edward III. declares that the outrageous and excessive apparel of divers people against their estate and degree is the destruction and impoverishment of the land, and prescribes the apparel of the various classes into which it distributes the people; it goes no higher than knights, but there are minute regulations for the clothing of women and children. This statute, however, was repealed the next year. In France there were sumptuary laws as old as Charlemagne, prohibiting or taxing the use of furs; but the first extensive attempt to restrict extravagance in dress was under Philip IV. By an edict of Charles VI. no one was allowed to exceed a soup and two dishes at dinner. Sumptuary laws continued to be introduced in England in the 16th, and in France as late as the 17th century. Scotland had also a similar class of statutes. The Scottish parliament attempted to regulate the dress of the ladies, to save the purses of the "puir gentlemen, their husbands and fathers." There was a prohibition against their coming to kirk or market with the face muffled in a veil; and statutes were passed against superfluous banqueting, and the inordinate use of foreign spices "brocht from the pairts beyond sea, and sauld at dear prices to monie folk that are very unablill to sustain that coaste." Neither in England, Scotland, nor France do these laws appear to have been practically observed to any great extent: in fact, the kings of France and England contributed far more, by their

love of pageantry, to excite a taste for luxury among their subjects than by their ordinances to repress it. Mr. Froude suggests that such statutes may have been regarded, at the time when they were issued, rather as authoritative declarations of what wise and good men considered right, than as laws to which obedience could be enforced. Enactments of this kind have long been considered to be opposed to the principles of political economy. Most of the English sumptuary laws were repealed by 1 James I., c. 25, but a few remained on the statute-book as late as 1856.

SUMTER, a co. in w. Alabama, adjoining Mississippi; bounded on the e. by the Tombigbee river, drained by Sucarnoochee creek and the Noxubee river; traversed by the Southern, the Alabama, Great Southern, and other railroads; about 970 sq. m.; pop. '90, 29,574, includ. colored. The surface is rolling and heavily wooded. The soil is fertile. The principal productions are corn, cotton, and live stock. Co. seat, Livingston.

SUMTER, a co. in c. Florida, 600 sq. m.; pop. '90, 5,363. The surface is level and partly swampy. Co. seat, Sumterville.

SUMTER, a co. in s.w. Ga., drained by the Flint river, its e. boundary, and by several creeks; traversed by the Georgia and Alabama, and the Central of Georgia railroads; area, 515 sq. m.; pop. '90, 22,107, chiefly of American birth, includ. colored. The soil is level and fertile; cotton, corn, and pork are the chief productions. Co. seat, Americus.

SUMTER, a co. in e. central S. C., drained by the Wateree and Black rivers and Lynch's creek; traversed by the Atlantic Coast Line railroad; about 870 sq. m.; pop. '90, 43,605, chiefly of American birth, includ. colored. Surface level and extensively covered with pine forest, the tar and turpentine from which are, with cotton, the main exports. Co. seat, Sumter.

SUMTER, FORT (originally spelled *Sumpter*, after Gen. Sumpter, in whose honor it was named), an American fort of the second class, built 1845-'55, in the form of a truncated pentagon 50 ft. high, on an artificial island, at the entrance of Charleston harbor, 2½ m. distant from Forts Moultrie and Pinckney, on either side. On the secession of South Carolina, Dec., 1860, Maj. Anderson, in command of the defenses of the harbor, was called upon to surrender them to the state authorities. Instead of doing this, he abandoned the other forts and occupied Fort Sumter, mounting 52 guns, with a garrison of 70 men and 30 or 40 workmen. This was considered an act of war by the confederates and their troops, who, under command of Gen. Beauregard, took possession of Forts Pinckney and Moultrie, and erected additional batteries. While the surrender of the fort was under consideration, a fleet was sent from New York for its relief. On its appearance off the harbor, the attack on the fort was opened by Gen. Beauregard, April 12, 1861, and it surrendered on the 13th. This event aroused the north, and began the war, which terminated in 1865. During the siege of Charleston this fort was battered by the heaviest artillery, until its walls were completely crushed and shattered. The flag-staff was shot away fifty times, and thousands of tons of iron projectiles were mingled with the débris of the fort; but the garrison constructed a still stronger fortress on its ruins, and held it for three years against assault and bombardment, until the operations of Gen. Sherman compelled its evacuation, and the United States flag was again raised, April 14, 1865; an event soon followed by the evacuation of Richmond, and the surrender of all the confederate armies.

SUMTER, THOMAS, 1734-1832, b. Va.; settled in South Carolina. He took part in the Cherokee war, and was prominent in the political movements which resulted in the revolution. He became col. of the 2nd regiment of riflemen in 1776, and remained in the state till the surrender of Charleston, when he enlisted a considerable force in North Carolina, and defeated a body of British and Tories. Soon afterwards he unsuccessfully attacked the post at Rocky Mount. Within a few days he defeated the Prince of Wales regiment at Hanging Rock and dispersed a large force of Tories. Routed in his turn by Tarleton at Fishing Creek, he recruited another force with which he beat Tarleton at Blackstocks, but was dangerously wounded. He was made brig. gen. of the S. C. militia, and was thanked by congress. In 1781 he enlisted 3 regiments of rangers and aided Marion and other generals. He sat in the convention which formed the federal constitution; was a member of congress, 1789-93 and 1797-1802, and was U. S. senator, 1801-09. He was U. S. minister to Brazil, 1809-11.

SUMY, a t. of Russia, in the government of Kharkov, and 90 m. n. w. of the town of that name, on the Psol. It is an important commercial center for the Ukraine, and has an extensive trade in horses, grain and sugar. Pop. '93, 22,764.

SUN, THE, the great luminary upon which not only our well-being but our very existence depends, has been from the earliest ages a source of wonder and admiration, and its worship was probably the very first form of idolatry. See SUN AND FIRE WORSHIP.

When the true system of the universe became known, one of the first labors of astronomers was to ascertain the distance and size of the sun, and these have been known for some time with tolerable precision; but until lately the most vague and unsatisfactory theories regarding its chemical and physical constitution have continued to prevail.

Within the last few years, however, our knowledge of its chemical and physical con-

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I



II



III



FIG. 1. THE SUN (PHOTOGRAPHED BY RUTHERFORD.)



IV



V



VI



VII



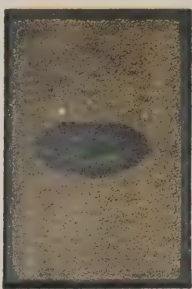
VIII



IX



X



XI



XII

FIG. 2. SUN-SPOT, OBSERVED MAY 10TH—22D, 1868.

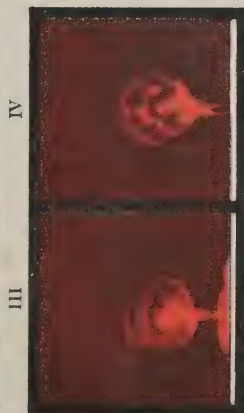


FIG. 4. PROTUBERANCES, OBSERVED BY ZÖLLNER, 1869.



FIG. 3. TOTAL ECLIPSE OF THE SUN, JUNE 18TH, 1860, AFTER RÜMKE.
I—VI ARE RAYS OF THE CORONA.

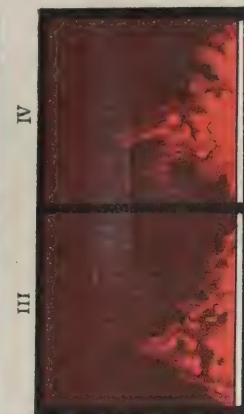
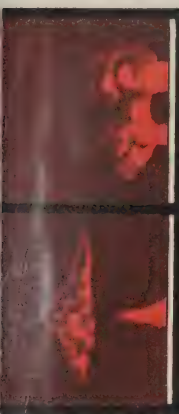


FIG. 5. PROTUBERANCES, OBSERVED BY ZÖLLNER, 1869.



FIG. 6. PROTUBERANCES, OBSERVED BY SECCHI, 1871.

stitution has increased with a rapidity probably unequaled in any other branch of science.

Our knowledge regarding the sun is best arranged under three heads: viz., *The general relations of the sun to our globe; the sun's chemical constitution; and its physical constitution.*

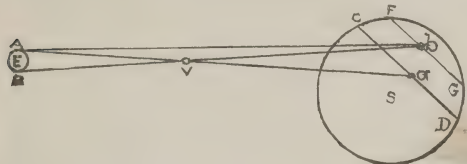
Relations of the Sun to the Earth, as the Source of Light and Heat.—In order to appreciate the grandeur of the scale on which solar activity is carried on, it is only necessary to know a few facts relative to the sun, which are best expressed by numbers.

1. *Distance of the Sun from the Earth.*—The difficulty in ascertaining the parallax (q.v.) of the sun arises from the smallness of the base line as compared with the distance of the object. The distance of the observing stations must always be less than 8,000 m.; from this the parallax of the moon, which is only 30 times 8,000, can be observed directly with tolerable nearness. But when the distance is many thousands times the length of the base line, the triangle is "ill-conditioned" or unfavorable to accuracy, and the problem must be approached indirectly. The first attempt to measure the distance of the sun was that made by the Greek astronomer Aristarchus in the third c. B.C., who made it only about one-twentieth of what we now know it to be. Even the great astronomer Kepler in the seventeenth c. could only say that the distance must be at least between 13 and 14 millions of miles. Subsequent estimates—for, owing to the imperfection of the methods and instruments, they were little better than estimates—rose to 80 millions. At last, in 1716, the English astronomer Halley proposed a method of employing the transits of Venus. Accordingly, the transits of 1761 and 1769 were observed in a variety of places; but the results at first deduced were discordant and unsatisfactory, until in 1824 the German astronomer Encke "discussed" the observations of 1769, and arrived at a distance of about $95\frac{3}{10}$ millions of miles; and this number held its place in books of astronomy for about many years. In the mean time, in the absence of transits, other methods, become possible through the growing perfection of astronomical instruments, were tried, and most of them concurred in pointing to a value nearly $3\frac{1}{2}$ millions less than that above stated; so that 91,500,000 came to be accepted as the approximate distance of the sun, until the transit of 1874 should settle it more definitely.

A transit can occur only when the planet is in or near one of her nodes at the time of inferior conjunction, so as to be in a line between the earth and the sun. The coincidence of these two conditions follows a rather complex law. There are usually two transits within eight years of one another, and then a lapse of 105 or 122 years, when another couple of transits occur, with eight years between them. The transit of 1874 was succeeded by that of 1882, and there will not be another until June, 2,004.

The way in which a transit is turned to account may be understood by the help of the accompanying diagram, where E represents the earth; V, Venus; and S the sun. It is to be premised that the *relative* distances of the planets from the sun are well known. Their periodic times can be observed with accuracy, and from these by Kepler's (q.v.) law we can deduce the *proportions* of the distances, but not the distances themselves. It is thus known that if the distance of the earth from the sun is taken as 100, that of Venus is 72. In the fig. then, AV is 28, or about one-third of Va or Vb.

An observer at a station, A, on the northern part of the earth will see the planet projected on the sun as at α , while a southern observer will see it at β . The distance of the sun from Venus being about three times her distance from the earth, it is obvious that



the distance ab will be three times the distance AB ; and it is a great advantage to have the stations A, B, as far apart as possible, as the interval ab is thus increased and its measurement rendered more accurate.

But how is it measured? For each observer sees only one of the spots, and does not know where the other is; and there are no permanent marks on the sun's surface to guide us. The difficulty is got over in the following way: Each observer notes the exact duration of the transit, that is, the time the spot takes to travel from C to D, or from F to G. Now as we know the rate of Venus's motion in her orbit, this gives us the lengths of the lines CD and FG in minutes and seconds of arc. Knowing then the angular diameter of the sun ($32'$) and the lengths of two chords CD and FG, we can easily, by the properties of the circle, find the distance ab between them. This gives us the angle aAb . In the triangle AVb , then, we know the angle at A and the proportion of the sides AV and Vb, and from that we can find the angle AbV or $A\beta B$. Now this is the quantity sought, being the parallax of the sun as seen from two stations on the earth. Whatever the distance AB actually is, the angle is reduced to correspond to a distance equal to the earth's semi-diameter. The parallax deducted by Encke, as above referred to, was only $8.5776''$, while the parallax corresponding to the other smaller measurement above stated is $8.94''$. The advantage of this roundabout procedure is that a comparatively large angle (aAb) is measured in order to deduce from it a smaller ($A\beta B$), so that any error in the measurement is diminished in the result.

The transit of 1874 was observed at more than fifty stations, astronomers from all the civilized world taking part in the work. The labor of discussing and comparing the observations has not yet been overtaken, but several partial results have been announced,

which still show considerable discrepancy. The chief source of uncertainty arises from the difficulty the observers found in determining the exact moment of "ingress" and "egress" of the planet, owing to the dense atmosphere of the latter rendering the limbs of the two bodies indistinct and distorted. Much was expected from the multitude of photographic pictures taken, but they have proved a failure. They are said to lack the necessary sharpness, and to be liable to other sources of error. The first partial discussion of the British observations gave, according to the astronomer royal, a result of $93\frac{2}{10}$ millions of miles. A more extended discussion since announced results in $92\frac{5}{10}$ millions of miles.

Elaborate arrangements were made, on an international plan, for observing the transit of 1882, and attempts made to obviate the defects of previous observations. Previous to this astronomers were turning with greater hope to other methods, especially to observations of Mars, and of some of the minor planets. From observations of Mars made in 1862, the American astronomer Newcomb deduced a distance of $92\frac{2}{10}$ millions of miles. The velocity of light, which has been determined by the ingenious optical experiments of Foucault and others, has also been pressed into the service of the problem. The aberration of light (q.v.) results from the relation of the velocity of light to that of the earth's motion in her orbit; and from the observed amount of the aberration we are thus able to deduce the earth's velocity. From knowing then the time of the earth's revolution, we can find the circumference of her orbit, and hence her distance from the sun. The most careful investigation by this method gives a distance of 93 millions of miles. An ingenious method of observing the parallax of Mars at its opposition, first suggested by the astronomer royal, but carried out by Mr. Gill on the island of Ascension in 1877, promises still more satisfactory results. The essence of the method consists in this, that instead of depending upon two sets of observers at different parts of the earth, one observer and one station are made to suffice. One observation is taken in the evening when the planet is rising, and another in the early morning when it is setting. In the mean time the rotation of the earth has transported the observer 6,000 or 7,000 m. through space, and this forms his base line. Mr. Gill's observations were made by means of the heliometer, the most effective of instruments for such purposes. From such of his observations as had been reduced at the end of 1878, Mr. Gill announces his belief that the sun's distance will prove to be nearer to 93 than to 92 millions of miles.

The other important numerical facts relative to the sun are the following: Its *diameter* calculated on the basis of the shorter distance hitherto received, is, in round numbers, 850,000 m., or more than 107 times the mean diameter of the earth; so that the *volume* or bulk of the sun exceeds that of the earth 1,200,000 times, and is 600 times greater than the bulk of all planets at present known, together. The *mass* of the sun, or quantity of matter it contains as measured by weight, exceeds that of the earth only 300,000 times; and thus it appears that the matter of the sun has only one-fourth the density of that of the earth. From this and other facts, it is inferred that the matter of the sun exists for the most part in a gaseous condition. Still his mass is 740 times greater than the masses of all known planets put together. The *period of rotation* of the sun upon its axis, which Galileo was the first to calculate from observations of the sun-spots, and which takes place in the same direction as that of the earth, is about 25 days 8 hours. It appears, however, that this period varies according to the solar latitude of the spots from which it is calculated. The *inclination* of the axis of the sun to the ecliptic is about $7\frac{1}{4}^{\circ}$, and the *longitude of the ascending node* is about $74^{\circ} 30'$.

2. The form or *figure of the sun* has been the subject of recent investigations. The polar and equatorial diameters of the sun's disk as observed, have been supposed to differ, though by a very small quantity only. The photographs of the sun do not quite agree in the amount of the value for the diameter with that given by observations.

The general laws by which the relation of our earth to the sun, as the source of light and heat, is governed, are of the most simple kind. The rays which emanate from the sun's disk into space proceed in diverging lines, and, on arriving at the earth, their intensity will be inversely proportional to the square of the sun's distance. This may be called the primary law; but the more obvious phenomena of solar heat and light are manifested to us under a secondary law depending on the obliquity of incidence of the sun's rays. See CLIMATE; EARTH; HEAT; LIGHT, etc.

3. *Chemical Constitution of the Sun.*—Astronomy has weighed and measured the sun long ago, and in our days chemistry, aided by physics, makes an analysis of it. The way in which this surprising result is arrived at is explained under SPECTRUM. The main fact on which the method rests is briefly this: that a substance, when comparatively cold, absorbs the very same rays which it gives out when heated. Hence it was inferred by Kirchhoff that if there was sodium or iron in a comparatively cold state in the solar atmosphere, above the source of light, these substances would produce black lines corresponding in spectral position with the bright lines which they give out when heated. On this principle the presence in the solar spectrum of hydrogen, magnesium, calcium, sodium, and metals of the iron group has been ascertained with something like certainty. There are less clear indications of other metals, such as zinc and lead; while metals of the tungsten, antimony, silver, and gold classes have been searched for in vain. Of the metalloids, such as oxygen, carbon, nitrogen, sulphur, and the like, none had been detected till, in 1877, Prof. Henry Draper of America announced the discovery

of oxygen. The presence of these substances in the sun is hardly doubted, but their identification is difficult. A chief source of complication in research of this kind is the effect on the spectra of substances produced by differences of temperature and pressure. Excessive heat seems to dissociate the groups of atoms forming the molecules into simpler groups, and thus produces a different spectrum difficult to recognize. The labors of Lockyer, Huggins, Janssen, Draper, and others are directed toward overcoming these and other obstacles.

4. *Physical Constitution of the Sun.*—Since the first discovery by Galileo of those remarkable phenomena on the sun called *sun-spots*—dark patches with an area frequently exceeding several times the surface of the earth—an immense variety of theories as to the probable constitution of the solar body has been brought forward by nearly every observer. Solar photography promises valuable aid in this research by enabling us to keep a permanent record of passing phenomena, ready at any time for deliberate measurement and comparison.

One of the most important discoveries in connection with sun-spots, science owes to Dr. Alexander Wilson of Glasgow, who, in the year 1769, observed certain general and remarkable features of sun-spots, which enabled him to establish the significance of these phenomena for a solution of the question as to the sun's physical constitution. These features are as follows: When a spot was near the middle of the sun, it was found to consist of a dark central part, called the *nucleus* or *umbra*, and around this was a comparatively brighter envelope, called the *penumbra*, and at such a time both parts were distinctly visible. But as the spot approached one border, the penumbra on the side nearest the observer became gradually more and more foreshortened, while the penumbra on the other side grew broader and broader, and at length, as the spot was disappearing—that is, passing the edge of the limb—the near side of the penumbra, as well as the dark central part, entirely vanished, nothing remaining except the opposite penumbra. When a spot made its appearance on the other side of the border, Wilson noticed the same phenomena in an opposite order, and soon discovered that they were nearly universal. It followed from these observations at once that every spot presents the appearance of a funnel-shaped opening in the sun's body, which, by the rotation of the latter, successively presented the described appearances. These observations have been abundantly confirmed by the photographic records of Messrs. De la Rue, Stewart, and Loewy.

Schwabe showed, as the result of nearly 40 years' observations, that the number of groups of sun-spots is not the same from year to year, but has a maximum about every 10 or 11 years; and Gen. Sabine recorded the wonderful fact that the various epochs of maximum spot frequency are also those of maximum disturbance of our earth's magnetism. Here, then, we have a very curious bond of union between the sun and the planets of our system.

It was next shown by Carrington that sun-spots have a proper motion of their own—those near the solar equator moving faster than those near the poles.

While spots are darker than the general surface of the sun, there are also frequently observed patches brighter than the general surface. These are called *faculae*, and they generally accompany spots, most frequently in their wake; but they are only distinctly visible near the sun's limb, and lose their specific luminosity near the center of the sun's disk.

Another phenomenon connected with our luminary is not less remarkable than sun-spots. This is the red flames, or *protuberances*, which were first observed surrounding the sun's disk on the occasion of a total eclipse, but which by ingenious methods of observation can now be rendered visible even when the sun is not eclipsed. This colored envelope, less brilliant than the *photosphere*, or light-giving surface, and having a mean height of 5,000 or 6,000 miles, is known as the *chromosphere*, and seems to consist mainly of incandescent hydrogen, jets of which are seen at times to be projected to a height of 200,000 miles. The velocity of these movements has been calculated to exceed at times 120 miles a second. Above the chromosphere there is a far deeper layer of cooler, sub-incandescent gases, among which is an unknown substance, which chiefly composes the outer portion, and is apparently lighter than hydrogen. These gaseous envelopes, extending together to 300,000 or even 500,000 miles above the photosphere, are now believed to cause the appearance called the *corona*, or white halo, which is seen to surround the dark body of the moon during an eclipse of the sun.

If a spot be a hollow, as we have reason to suppose, it is only necessary to believe that there has been a descending current of this cold absorbing atmosphere to account for the want of luminosity. In like manner, on this hypothesis, a facula will be a portion of the luminous matter, which has been removed high up into the atmosphere, and which thus escapes the absorbing influence of the atmosphere. A spot may thus be supposed, to be produced by two currents—one ascending, and carrying the hot luminous matter up; the other descending, and carrying the cold atmosphere down. The photosphere is thus in a constant state of agitation like ebullition.

Spots and their accompanying faculae are an indication of the activity of those "convection currents" by which heat is brought to the surface to replace what has been radiated off. Their temporary prevalence then is held to be a sign of more than ordinary solar activity or expenditure of energy. This is palpably manifested on our globe in the greater magnetic disturbance that takes place when sun-spots are numerous, as

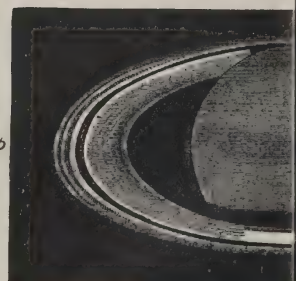
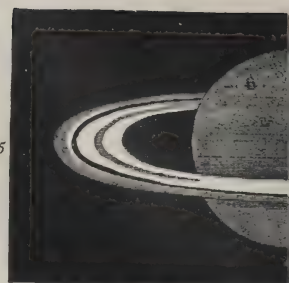
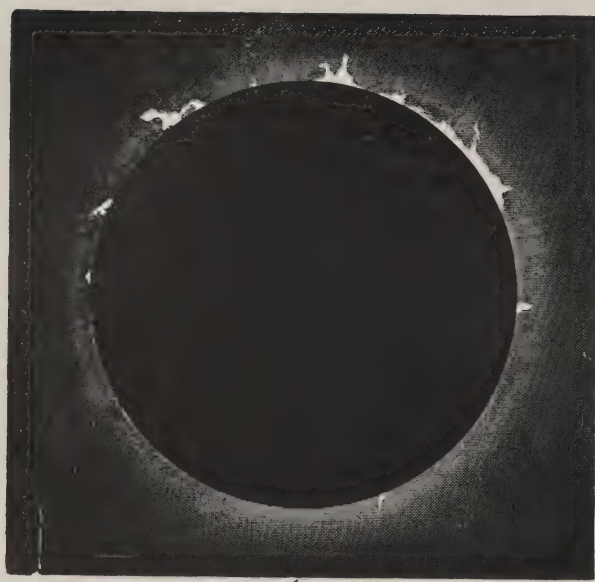
before mentioned. The diurnal range of the magnet freely suspended in the Kew observatory, shows an unmistakable correspondence with the waxing and waning of the spotted area on the sun; and the frequency of auroræ is found to be in perfect correspondence with prevalence of spots. It is natural to seek to connect cycles of weather with the spot-period of the sun, but nothing has yet been conclusively established. A coincidence has seemingly been made out between the recurrence of famines in southern India through deficient rain and the period of minimum spots; but the coincidence does not hold for other localities. Attempts have even been made to bring commercial crises and other recurring events into the spot-cycle.

As to the cause of the periodicity of sun-spots, observations made at Kew seem to establish a connection between the behavior of spots and the proximity of prominent planets; and it may thus be found that the recurrence of certain planetary positions in some way determines the spot-period.

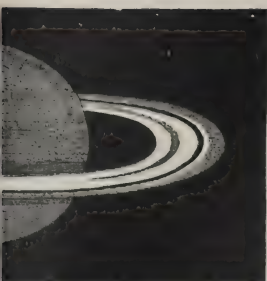
It was thought that the transit of 1874 would furnish data for obtaining the sun's parallax to within 0."10, but the result has been disappointing. The distance obtained from the American photographs—213 in number—is 92,028,000 m., using the figures given by Col. Clark for the dimensions of the earth. The transit method of determining the sun's distance has been found to be not as accurate as it had for a long time been supposed; still a large number of thoroughly equipped expeditions observed the transit of 1882, and the results were generally satisfactory. Prof. Ball places the sun's distance at 92,700,000 m., and estimates the error to be not more than 300,000 m. Dr. Hastings, in 1879-80, conducted a series of experiments, which resulted in finding a slight difference between the spectra of the center and the limb of the sun, the difference being about the same as that between the spectra of a spot and the unbroken photosphere. From his investigations he formulated a theory of convection currents, starting from a lower level, where all the substances would be vaporized; as it rises heat is lost, and condensation and precipitation take place. This precipitation forms the granules. When a downward convection current is increased, there is a rush of vapors to that point, carrying along the precipitated clouds (or smoke) which at this point congregate and form a spot. During the total eclipse of 1883, May, the corona was carefully studied, and Dr. Hastings concludes that it is due mainly to diffraction phenomena, and that the corona is only a narrow belt. Janssen also finds in it a large amount of reflected light. In one coronal stream Tacchini discovered green and yellow bands, which are characteristic of comets. Huggins has been trying to obtain photographs of the corona without an eclipse, and it has been thought that he has gotten a true picture, at least as far as 8' from the sun's limb. Photographs of the corona taken near the maximum period of spots have been found alike, and those at the minimum period also alike, seeming to establish a connection between the spot periods and the corona. Prof. Langley, in 1882, conducted a series of experiments upon the summit of Mt. Whitney, from which he concludes that the heat radiation of the sun is much greater than has been supposed. In 1882 Dr. Siemens explained, before the Royal Soc. of London, a new theory of the origin of solar heat: he supposes space to be filled with something more substantial than ether; or that oxygen, hydrogen, nitrogen, and some of their compounds exist in space in a highly rarefied condition. The attraction of the sun causes a constant inflow of this cosmical matter, and its rotation projects it out in a stream at the sun's equator. During the inflow these substances pass from their rarefied condition to one of greater compression and higher temperature, until, near the sun's surface, they ignite, developing great heat; and after a while they are thrown off at the equator into space, where they again become dissociated. On this hypothesis it is this constant inflow and outflow that keeps up the undiminished heat of the sun.

SUN AND FIRE WORSHIP. All investigation tends to show that nature-worship was the basis of all polytheistic religions, and that the chief deities of the several mythologies were originally personifications of the sun, or of particular influences of the sun. The original solar nature of Jupiter, Zeus, Odin, Baal, Amen Ra (see EGYPT), Indra, etc., can hardly be mistaken. See those heads; also SCANDINAVIAN MYTHOLOGY, PHENICIA; and for a full development of the subject, Max Müller's essay on *Comparative Mythology* (Oxford Essays; 1856). The actual sun, however, still continued an object of worship, more especially as in the abstract and more strictly personal gods, moral and intellectual attributes came to predominate over and obscure the physical (see HELIOS); and with the worship of the sun was more or less closely associated that of fire—his representative on earth. See PARSEES, NEEDFIRE, BELTEIN.

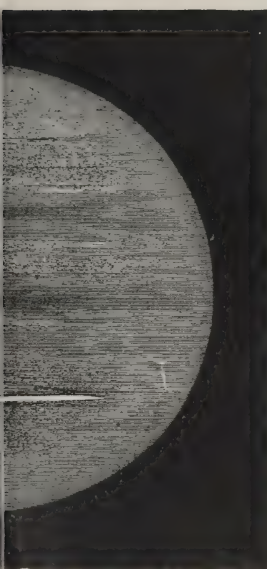
The most complete system of sun-worship that we have any account of is that existing in Peru when discovered by the Spaniards (1526). "Our northern natures can hardly comprehend how the sun, and the moon, and the stars were imaged in the heart of a Peruvian, and dwelt there; how the changes in these luminaries were combined with all his feelings and his fortunes; how the dawn was hope to him; how the fierce mid-day brightness was power to him; how the declining sun was death to him; and how the new morning was a resurrection to him; nay, more, how the sun, and the moon, and the stars were his personal friends, as well as his deities; how he held communion with them, and thought that they regarded every act and word; how, in his solitude, he fondly imagined that they sympathized with him, and how, with outstretched arms he appealed to them against their own unkindness, or against the injus-



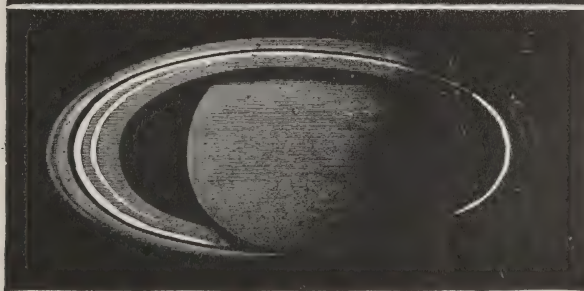
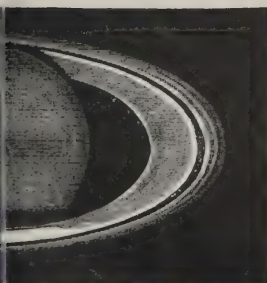
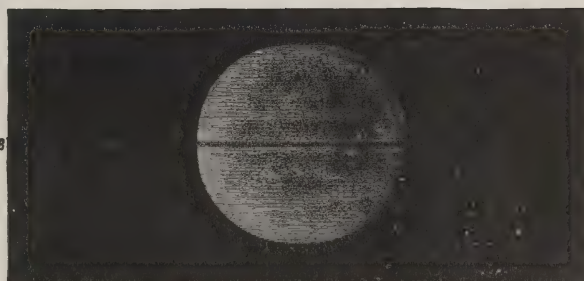
SOLAR SYSTEM.—1. Total eclipse of the sun, July 18, 1860. 2. Section of the moon's disk, S
6. Saturn, Nov. 27, 1855. 7. Saturn,



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1. 13, 1867. 3. Mars, April 25, 1856. 4. Jupiter, Aug. 13, 1867. 5. Saturn, Oct. 10, 1850.
6. 8, 1868. 8. Saturn, Jan. 23, 1849.

tice of his fellow-men."—Helps's *Spanish Conquest of America*. The Incas, as the Peruvian monarchs were called, claimed to be children of the sun, and his representatives on earth. Their government was a despotic theocracy, of which the Inca was both high-priest and king. In Cuzco, the capital, stood a splendid temple to the sun, all the implements of which were of gold. On the w. end of the interior was a representation of the sun's disk and rays in solid gold, so placed that the rising sun, shining in at the open e. end, fell full upon the image, and was reflected with dazzling splendor. In the place or square of the temple, a great annual festival was held at the summer solstice. The multitude, assembled from all parts of the empire, and presided over by the Inca, awaited in breathless solemnity the first rays of their deity to strike the golden image in the temple, when the whole prostrated themselves in adoration. Sacrifices, similar to those of the Jews, were offered on the occasion, and bread and wine were partaken of in a manner strikingly resembling the Christian communion.

SUNBIRDS, *Cinnyridæ*, a family of birds of the order *insessores* and tribe *tenuirostres*, which may be regarded as a connecting link between the creepers and the humming-birds, and as occupying nearly the same place in the tropical parts of the Old World which belongs to the humming-birds in America. They are all of small size, although none are so small as the smallest humming-birds; they rival humming-birds in brilliancy of plumage, and like them they feed on the juices of flowers, which they suck by their long bill; they do not, however, flutter on the wing when feeding, like humming-birds, but perch on or beside the flower into which the bill is to be inserted. The species are very numerous, and are natives of the southern parts of Asia, the eastern Archipelago, and Africa. The resplendent metallic plumage belongs only to the male, and only to the breeding season.

SUNBURY, a co. in s.e. New Brunswick, crossed by branches of the Canadian Pacific railroad; drained by St. John river; 1200 sq. m.; pop. '91, 5762. The surface is mostly level and densely timbered; the soil is fertile. Co. seat, Oromocto.

SUNBURY, borough and co. seat of Northumberland co., Pa.; on the Susquehanna river, and the Northern Central, the Pennsylvania, and the Philadelphia and Reading railroads; 56 miles n. of Harrisburg. It is an important shipping point for coal; has silk and saw mills, rolling mill, nail works, coffin and casket factory, several large railroad machine and repair shops, hosiery factory, and door and sash mills; and contains a national bank, high school, and electric street railroad plant. It was founded in 1772. Pop. '90, 5930.

SUNDA ISLANDS, that great chain of islands belonging to Malaysia, running e., including four large islands, Sumatra (q. v.), Java, Borneo and Celebes, and many smaller ones, Timor (q. v.), Bali, Lombok, Sumbava, Floris, Sumba, etc., and separating the Java sea from the Indian ocean. Sunda strait is a passage, from 70 to 90 m. in breadth, between Sumatra and Java.

SUNDAY. See **SABBATH**; **LORD'S DAY**.

SUNDAY-SCHOOLS were founded about the close of the year 1781 by Robert Raikes, a printer in Gloucester. Business leading him into the suburbs of the town, inhabited by the lowest class of the people, he was struck with concern at seeing a group of children, miserably ragged, at play. He was informed that "on Sunday the street was filled with a multitude of wretches, who, having no employment on that day, spent their time in noise and riot, playing at chuck, and cursing and swearing." To check this deplorable profanation of the Lord's day he engaged four women, who kept dame schools, to instruct as many children as he should send them on the Sunday, in reading and the church catechism, for which they were to receive one shilling each. In a short period a visible improvement was effected both in the manners and morals of the children, who came in considerable numbers; they attended church with their mistresses, and a great many learned to read and say their catechism. Such was the origin of the Sunday-schools. This excellent scheme was noticed in the Gloucester newspaper in 1783; but a letter of Mr. Raikes, from which the above account is taken, published in the *Gentleman's Magazine* in 1784, first drew general attention to it. Numerous schools, formed on the same model, sprang up in all the principal towns; and a society, under high patronage, was formed in London in 1785 for the establishment and support of Sunday-schools throughout the kingdom, which in 14 years expended £4,000 in payment of teachers. Her majesty, Queen Charlotte, admitted Mr. Raikes to an audience, and expressed her high approbation of his plan. This was the first stage of the Sunday-school. The great impediment to its prosperity was the expense of hiring so many teachers. Even in Gloucester, the birthplace of the Sunday-schools, after Mr. Raikes's death in 1811, all the Sunday-schools were closed for a time owing to want of funds. Whoever first conceived the idea of gratuitous instruction has nearly as great merit as Mr. Raikes himself; but probably it was suggested by necessity to many minds in different places at the same time. It was the means of starting Sunday-schools on a new career of success, and the idea spread so rapidly that, by the year 1800, the teaching was almost universally gratuitous. A higher class of teachers offered their services; the schools ceased to be filled by the very poorest alone; handsome buildings were erected in connection with the different churches and chapels, or by general subscription, and

that system was organized which has covered the land with schools. The secular teaching, which in certain instances included writing and arithmetic, was not of a very high order; but it placed the key of knowledge in the hands of multitudes who would otherwise have been unable to read; and the religious instruction with which it was combined has molded the character of some of the best men in England. In 1803 the Sunday-school union was formed, which, by its numerous publications, its traveling agents, and its connection with branch societies in every part of the kingdom, has exercised great influence on the Sunday-school cause. The institute of the church of England, which operates in a similar manner, is of later date. Within the last 40 years the Sunday-school has entered upon a third stage of its history. The improvement and multiplication of week-day schools obviate the necessity for teaching reading in Sunday-schools, so that they have gradually become restricted to religious instruction. Sunday-schools have prospered in Scotland, where religious teaching alone ever prevailed, and the stability of this modern invention is accomplished.

The Sunday-school found its way into Scotland as early as the year 1782; but it was not till 1786, when the society for promoting religious knowledge among the poor was formed, that it was publicly recognized; nor till 1797, when the gratis Sunday-school society was originated, that schools became general. At first they met with considerable opposition from portions of the ecclesiastical courts, but they are now supported by all the churches. Sunday-school unions exist in Edinburgh, Glasgow, and most of the large towns. The names of Dr. Chalmers, James Gall, the author of the *Lesson System*, and David Stowe, the author of the *Training System*, deserve mention in connection with the progress of Sunday-schools in Scotland. In Ireland Sunday-schools had been partially anticipated in county Down in 1770; but it was not till 1785 that the system pursued by Mr. Raikes was adopted, since which its history has been analogous to that of England. The Sunday-school society for Ireland was established in 1809. Sunday-schools were introduced into New York in 1816, through the exertions of some benevolent ladies, from which they have spread themselves through the United States. They are now to be found wherever the English tongue is spoken. They thrive vigorously in the Protestant churches of France; and more recently have been planted in parts of Germany and of Italy. The first permanent Sunday-school organization in the United States, of which there is authentic record, was the First-day or Sunday-school society, formed in Philadelphia, 1791. It was composed of members of different denominations including the society of Friends. Its constitution required that the instruction given in its schools should be "confined to reading and writing from the Bible, and such other moral and religious books as the society may direct." The New York Sunday-school union was instituted, 1816; the Philadelphia Sunday and adult school union, 1817. These three societies recognized the union of different denominations, and led to the organization of the American Sunday-school union at Philadelphia, 1824. The suggestion that such an association should be formed came from New York. Its object was to concentrate the efforts of Sunday-school societies in different sections of the United States, and to endeavor to plant such schools wherever there is a population. As the new states were settled and the various religious denominations were strengthened, more attention was given by each to its own Sunday-schools, and denominational unions to promote them were formed. In the early history of the schools the chief thing expected of the children was to commit to memory portions of scripture, and the chief employment of the teachers was to hear the recitations. Afterward the question book was added to the recitation, and at length in a great degree superseded it. Still later came the lesson helps, golden text, blackboard exercises, etc. In the first schools, reward tickets were given, and when they had sufficiently accumulated were exchanged for books. This stimulated the production of volumes of suitable character, and from this the Sunday-school library has been developed. In 1890 the number of Sunday-schools in the United States, exclusive of the Roman Catholic and Hebrew schools, was reported at 108,939, with 1,151,340 teachers and officers and 8,649,131 scholars. The Roman Catholic Sunday-schools in the United States contained upward of 700,000 scholars. In England and Wales the number of scholars attending schools of all denominations was 6,350,266; in Scotland, 711,188; in Ireland, 338,231; in France, 53,110, and in Germany, 431,221.

SUNDERBUNDS, a tract of British India, presidency of Bengal, consists of a number of low islands, forming the delta of the Ganges. The tract extends e. from the mouth of the Hoogly to the island Rabanabad, is 158 m. long, 75 m. broad, with an area of 7500 sq. m. Only the northern part is inhabited, the south being mainly jungle, abounding in tigers, leopards, buffaloes, crocodiles, and snakes. The only town worthy of mention is Port Canning, connected with Calcutta by rail. The scanty population (1882, 413) raise rice, indigo, jute, betel, and sugar-cane.

SUNDERLAND, a thriving municipal and parliamentary borough and seaport, in the county of Durham, 14 m. n.e. of the city of that name, at the mouth of the Wear. The town may be said to be co-extensive with the parliamentary borough, and to include the suburbs of Bishop-Wearmouth on the s. bank, and Monk-Wearmouth and Southwick on the n. bank of the river, connected with Sunderland proper by an iron bridge of one arch, 236 ft. long, and nearly 100 ft. above the river at low water. The bridge over the Wear was erected in 1796, but was repaired and widened in 1858 by Robert Stephenson (q.v.), at the cost of about £40,000. On both sides of the river there are extensive wet

docks, much of the area of which has been reclaimed from the sea. The harbor, which is defended by batteries, is formed by two great piers, one 650 yards and the other 590 yards in length; and the port is resorted to by vessels of the largest tonnage, from all commercial countries. After Newcastle, Sunderland is the greatest coal-shipping port in the world. The *Pemberton* coal mine is said to be the deepest in existence. The sanitary condition of the town has been recently greatly improved, a large new infirmary was built in 1867, and in 1868 a spacious workman's hall. Shipbuilding is one of the principal branches of industry. Machinery, glass, earthenware, ropes and chains, anchors, and other iron-wares, are very extensively manufactured. The public park of Sunderland, about 70 acres in extent, is adorned with a bronze statue of gen. sir Henry Have-lock, a native of the town, and commands a fine view of the sea. The village of Roker, a mile from the town, is much resorted to for sea-bathing. Fishing is carried on to a considerable extent. Pop. of parliamentary borough, which returns two members to the house of commons, '91, 131,015.

SUNDERLAND, ROBERT SPENCER, second Earl, was the only son of HENRY, first earl, who had been raised to the peerage in 1643, for his exertions in the royal cause. He was born in 1640, and after serving as ambassador to several courts, became in 1679 secretary of state. He had by this time manifested remarkable talent. Bishop Burnet says of him, "He had a superior genius to all the men of business that I have yet known." At first, he united with Essex and Halifax in opposing Shaftesbury, who wished to set Monmouth on the throne, and favored the exclusion of the duke of York. He encouraged the king to persevere in the degrading French alliance, and, with the duchess of Portsmouth, to whom he attached himself, negotiated a treaty by which, in consideration of an annual pension from the French king, Charles was to agree to assemble no parliament for three years. Before the end of the year, he had shaken off Essex and Halifax; and a new triumvirate, consisting of himself, lord Hyde, and Godolphin, succeeded to the confidence of Charles II. The treaty with France was broken off, and Sunderland, who was now afraid of the whigs, engaged the king in a more popular alliance with Spain. After the dissolution of the last of the exclusion parliaments, he lost his office; but the duchess remained faithful to him in disgrace; and by her influence, and that of lord Rochester, he was, in 1682, says Bishop Burnet, "upon great submission made to the duke [of York], again restored to be secretary." He remained in office until the accession of James II., when his influence in the ministry became greater than ever. He who had so often saved himself in the former reign by the influence of the duchess of Portsmouth, now secured himself another patroness in the king's second wife, the Princess of Modena. Although there is reason to believe he gave some encouragement to Monmouth in his rebellion, he managed, with consummate art, to obtain the entire confidence of James, and in 1685 became prime-minister. He was intrusted with a knowledge of the king's intention to establish the Roman Catholic religion as the national church, and was indeed the only minister in whom the king confided. In 1687 he privately conformed to the Roman Catholic church, and afterward openly professed his conversion. His influence was so great, that James would grant no favor until he had asked the question, "Have they spoken to Sunderland?" and when told that this nobleman got all the money of the court, he would reply, "He deserves it." Yet we find him about this time in correspondence with the Prince of Orange, afterwards William III. The princess Anne described Sunderland as "the subtillest workingest villain that is on the face of the earth." Burnet says he entered into a particular confidence with the prince of Orange, which he managed by his uncle, Mr. Sidney, who was sent envoy to Holland. With profligate but masterly dexterity, he contrived to deceive both his master and Barillon, and to keep them in ignorance of the events that were passing in Holland. When the prince arrived in England, Sunderland and his wife went to Amsterdam, whence he wrote to the new monarch, claiming his favor and protection on the ground that he had all along been in his interest. In 1691 he was allowed to return to England, and to kiss the king's hand. In 1695 William III. spent a week at Sunderland's house at Althorpe. It was imputed to him that he had changed his religion, in the late reign, in order the more effectually to ruin King James; and it was generally believed that he had rendered king William, when prince of Orange, some signal services, which no one else could have done. This belief gained credit from the favor shown him by William. He was made lord chamberlain, and as such took his seat at the head of the council table. After directing affairs as the acknowledged head of the government, he resigned office in 1697, and retired to private life. He spent the rest of his days at Althorpe, where he died in 1702. He never shone as a public speaker. He had, however, unusual abilities for business, and a rare skill in the art of insinuation. He possessed exquisite courtly talent, extraordinary versatility, and a flexibility of principle too common in his day, but carried by him to the most reprehensible lengths. By his wife, Anne, daughter of the second earl of Bristol, he left CHARLES SPENCER, third earl, who was born in 1674. He was described by Evelyn as a youth of extraordinary hopes, very learned for his age, and ingenious. He was for some time secretary of state in the reign of Queen Anne, and under George I. rose to be all-powerful; but in 1721, being accused of receiving £50,000 worth of the fictitious stock distributed by the direc-

tors of the South Sea scheme (q.v.), in order to bribe the government, he was acquitted only by an inconsiderable majority and that from party considerations, and the indignation of the public made him resign his office. He died in 1722, not without suspicion of having intrigued, after his fall, for the restoration of the tories, if not for the return of the pretender. Sunderland was a type of the political morality, or rather immorality, of a disgraceful age, when the greatest statesmen made no scruple of sacrificing either their own party, or the interests and dignity of the nation, to personal ambition. His title descended to CHARLES, his second son, who succeeding, 1733, to the honors of his illustrious grandfather, John Churchill, the earldom of Sunderland became absorbed in the dukedom of Marlborough. His third son, JOHN, was ancestor of the earls Spencer.

SUN-DEW, *Drosera*, a beautiful and interesting genus of plants of the natural order *dioscoreaceæ*, several species of which are natives of America, found in bogs and moist heathy ground. A common species is the ROUND-LEAVED SUN-DEW (*D. rotundifolia*), which is plentiful in almost all places suitable to the plant. The leaves all spring from the root, and spread out in a rosette, from the center of which springs the flower-stem or scape, with a raceme of flowers all on one side. The leaves of this and the other species are fringed and beset in all parts with hairs, which bear at their extremity viscid glands, and the irritation of these glands causes them to contract and fold up, so that insects are imprisoned by them. Recent observation has proved that these insects are actually digested by the plant, their nutritive material being absorbed by it. Compare the *dionæa* (q.v.), and see Darwin's *Insectivorous Plants* (1875). The whole plant is acrid, curdles milk, and has a reputation for removing corns, bunions, and warts. An agreeable liqueur, called *rossoli* (*ros solis*) is made by infusing the plant in brandy, with sugar, etc.

SUN-DIAL. See **DIAL**.

SUNFISH, *Orthogoriscus*, a genus of fishes of the family *diodontidæ* (see **DRODON**), having the body compressed, and not capable of inflation, as in the other *diodontidæ*; abruptly terminating in a very short tail; the dorsal and anal fins long and pointed, united to the short tail-fin; each jaw furnished with a cutting edge of bone instead of teeth. The species chiefly inhabit the seas of warm climates, but two are occasionally seen on the coasts of Britain. The SHORT SUNFISH (*O. mola*), when young, is almost perfectly round, but becomes rather more elongated when full grown. The name sunfish is variously regarded as derived from the form of the fish, and from its habit of floating at the surface of the water in fine weather, as if to enjoy the sunshine. It attains a large size, being sometimes more than six ft. in length, and is captured by sailors. Its flesh is white and well flavored, somewhat resembling that of the skate. The liver yields a large quantity of oil, which is in repute among sailors as an external application for the cure of sprains, rheumatism, etc. The OBLONG SUNFISH (*O. oblongus*), of which specimens have also been taken on the British coasts, but more rarely, is of a longer form. It also attains a large size. The sunfishes feed upon sea-weeds.

SUNFLOWER, *Helianthus*, a genus of plants of the natural order *compositæ*, suborder *corymbifera*, having large flowers; the florets of the ray strap-shaped, without stamens or pistils, yellow or orange; the florets of the disk tubular, perfect, yellow or purplish-brown; the flowers solitary or in corymbs, with an involucre of numerous leaves; the fruit compressed, with a pappus of two or more deciduous scales. The species are numerous, all natives of America; large herbaceous plants, with opposite or sometimes alternate undivided leaves. The ANNUAL SUNFLOWER (*H. annuus*), common in our flower-gardens, is a native of tropical America, where it sometimes attains a height of 20 feet. The stem is thick and rough; the flowers solitary, and from one foot to two feet in diameter, nodding; the leaves heart-shaped-ovate. This plant is now cultivated in almost all parts of the world, and in the s. of Europe is sometimes a field-crop; the seeds being valued as food for cattle and poultry, and on account of the oil which they yield, which is little inferior to olive oil. An acre of good land produces about fifty bushels of seed, each bushel yielding a gallon of oil. The seeds are also used like almonds for making demulcent and soothing emulsions; and in some parts of Europe, a bouilli is made of them, which is used as food for infants. The American Indians make bread of them. The flowers abound in honey, and are much frequented by bees. The leaves are good fodder for cattle. The stems are used for fuel, and yield much potash.—The Jerusalem artichoke (q.v.) belongs to this genus.

SUNFLOWER, a co. in n.w. Mississippi, traversed centrally by the Sunflower river; 720 sq.m.; pop. '90, 9384. Co. seat, Indianola.

SUNFLOWER STATE. See **STATES**, **POPULAR NAMES OF**.

SUNN, *Crotalaria* (q.v.) *juncea*, a leguminous plant, native of India, which has been in general cultivation there from time immemorial, for the fiber of its bark. It has a strong general resemblance to Spanish broom. It is, however, an annual plant. The plant is cultivated not only for its fiber, but as food for milch-cows. The seed is generally sown in April or May, and in August it is pulled, or cut close to the ground—when grown for its fiber—laid in long rows till the leaves begin to rot and separate from the stalks, and steeped in water for a few days, till the bark separates freely. The

fiber is not so strong as hemp; but good cables, canvas, and cloth are made of it. It is now imported in considerable quantity into Britain. It is known by various names. *Taag* is one of its Indian names, and it is sometimes called *brown hemp*, *Bengal hemp*, etc. The confusion of names makes it difficult to ascertain the quantity imported.

SUNNA (Arab. custom, legal usage), originally denotes among Moslems the sayings and the example of Mohammed and his community, provided they are in accordance with the Koran, the meaning of which, however, is itself explained by the Sunna. The term is therefore (though incorrectly) used for the collections of moral and legal traditions traced to the prophet, which supplement the Koran, somewhat like the Mishna (q.v.), which supplements the laws of the Pentateuch. The Sunna not only comprises religious doctrines and practice, but also civil and criminal laws, and the usages of common life: the way to eat and to drink, and to dress, and the like. This tradition is first heard of during the civil wars among the adherents of the new faith, about half a c. after the flight. The single traditions, as we now possess them, rarely exceed six lines. The diction is carefully wrought, and the form is that of a dialogue. For the credibility and canonicity of a tradition, it was originally necessary that it should have been *heard* by one truthful witness; but this law was much relaxed in after-time. At the end of the 3d c. (H.), a countless number of individual collections (Mosnad), mostly of an apocryphal character, had been produced by different theologians, but the first who sifted them critically, and without regard to any special theological system, was Bochary (d. 256 H.). His collection contains 7,275 single traditions, 4,000 of which, however, occur twice in the work. Moslim, his pupil, supplemented Bochary with another collection, containing 12,000, again including 4,000 repetitions. Besides these, there are four more "canonical" collections; by Abû Dawûd (d. 275 H.), Tirmidzy (d. 279), Nasâ'î (d. 303), and Mâga (d. 273). The Sunna, as we have it in these collections, contains, broadly speaking, more truth than it is generally supposed to contain, and, critically used, is, besides the Koran, the most authentic source of Islam. A selection from the different collections (both canonical and otherwise), called *Mishcat Al Masabih*, has been translated into English by capt. Matthews (Calcutta, 1809). Fragments from Bochary are found in a German translation, by Hammer, in the *Fundgruben des Orients*.

SUNNITES, traditionists or believers in the Sunna (q.v.); the name of the "orthodox" Moslems as opposed to the Shi'ites (q.v.). They are subdivided into four principal sects, who, though at issue on different minor points, yet are acknowledged by each other to belong to the faithful, and to be capable of salvation, and they each have a special oratory at Mecca. The first of these sects are the Hanefites, founded by Abu Hanifa, who died 150 years after the Hegira. They are emphatically called "the followers of reason," whilst the other three are guided exclusively by tradition. They allow reason to have a principal share in their decisions on legal and other points. To this sect belong chiefly the Turks and Tartars. The second sect are the Malekites, founded by Malek Ibn Ans, who died about 180 H. at Medina. As one of the chief proofs of his real piety and humility, it is recorded that when asked for his decision on 48 questions, he would only decide on 16, freely confessing his ignorance about the others. In Barbary and other parts of Africa, the greatest part of his adherents are found. Mohammed Al Shâfe'i, born in Palestine, 150 H., but educated in Mecca, is the founder of the third sect, the Shâfe'ites. He was a great enemy of the scholastic divines, and seems altogether to have been of an original cast of mind. He never swore by God, and always took time to consider whether he should at all answer any given question or hold his peace. The most characteristic saying recorded of him is, "Whosoever pretends to love both the work and the Creator at the same time, is a liar." He is accounted of such importance, that, according to his contemporaries, "he was as the sun to the world, and as health to the body;" and all the relations of the traditions of Mohammed were said to have been asleep until he came and woke them. He appears to have been the first who reduced Moslem jurisprudence into a method, and thus made it, from a number of vague sayings, a science. His followers are now chiefly found in Arabia and Persia. Ahmed Ibn Hanbal founded the fourth sect, the Hanbalites. He was born 164 H., and was a most intimate friend of Shâfe'i. His knowledge of the traditions (of which he could repeat no less than a million) was no less famed than was his piety. He taught that the Koran was not created, but everlastingly subsisted in the essence of God; a doctrine for which he was severely punished by the caliph Almotasem. On the day of his death, no less than 20,000 unbelievers (Jews, Christians, and Magians) are said to have embraced the Mohammedan faith. Once very numerous, the Hanbalites now are but very rarely met with out of Arabia. On the differences between the Sunnites and Shi'ites, see SHI'ITES.

SUNSTROKE (INSOLATION, THERMIC FEVER, HEAT APOPLEXY, HEAT ASPHYXIA, THERMOHÆMIA, ERETHISMUS TROPICUS, HEAT FEVER, COUP DE SOLEIL). Two distinct conditions of the human body must be recognized as produced by exposure to heat.

There is a certain similarity in their symptoms, but a wide difference in their immediate pathology and in the indications for treatment. Although their individuality was pointed out many years ago, they have frequently been confounded by writers, and the terms heat exhaustion and sunstroke have not infrequently been used as synonymous. They are here considered as separate affections.

I. *Heat Exhaustion*.—Any one who has been long exposed to high temperatures, under conditions requiring much physical exertion, must have noticed the feeling of general weakness and relaxation which results.

Our every-day experience reaches this far; a step further brings up to us a case in which acute symptoms are severe enough to cause alarm. The attack may come on slowly, but may be as abrupt as in true sunstroke; and the severest cases may happen in the strong and robust as well as in the weak and feeble. The mind is generally clear, the pulse rapid and feeble, the surface of the body cool, the voice weak, muscular weakness marked, and the feeling of exhaustion extreme. This gives a picture of an ordinary case of heat exhaustion. There is another form, however, in which the heart does not seem to suffer principally, but in which there is collapse, with palsy of the vaso-motor system, with great fall of body temperature and marked general nervous symptoms.

The following is a case in point:

"A very powerful man, while working in an intensely hot, confined space, fell down suddenly without giving any warning, and was brought into the hospital. He was in a state of restless, delirious unconsciousness, incessantly muttering to himself, and when shaken or shouted at, responding only by a momentary grunt. The pulse was rapid, fluttering, and feeble. The surface of the body was covered with a very heavy sweat and exceedingly cold. The muscular relaxation was extreme. The facies was that of collapse, and the temperature, taken in the mouth, was 95.25° F."

The treatment of heat exhaustion is obvious from the symptoms. The indications being to stimulate the flagging circulation and warm the body by heat applied externally with an energy proportionate to the severity of the case. In mild cases stimulation with whisky will suffice; in the more severe, digitalis, ammonia, and atropia may be necessary.

II. *True Sunstroke, or Thermic Fever*, as it is called by Wood, is always caused by exposure to excessive heat.

As the body can cool itself much more rapidly by perspiration and its evaporation in a dry atmosphere, it is able to resist the influence of a dry, overheated air much better than where there is much moisture. It is for this reason that sunstroke is so much more infrequent upon high table-lands, or in the dry belt of our Texan prairies, than in the lowlands of India or upon our own sea-coast. Hence we find, during the very hot weather in New York, an increase in temperature, with corresponding increase in the humidity of the atmosphere, is followed by an increased number of cases of sunstroke.

Indoor workers in confined, moist factories, and especially in laundries and sugar refineries, are especially prone to be attacked.

At one time it was thought that exposure to the sun's direct rays was the chief cause of sunstroke, but there is now abundant clinical testimony to the effect that such exposure is not necessary, attacks, indeed, often coming on at night.

Although the immediate cause of the attack is excessive heat, there are certain conditions which act as predisposing causes, by lessening the powers of resistance of the system to the heat. The chief predisposing causes are race, excessive bodily fatigue, and intemperance.

Races which are least accustomed to a tropical climate are most apt to be attacked; thus, both in this country and in India, Europeans suffer more than the natives. No race, however, is absolutely exempt. Even the negro and the Hindoo are occasionally prostrated.

The general experience in the United States shows that habitual excess of alcohol very strongly predisposes to sunstroke. Cases of insolation in this latitude are generally seen by the physician after the stage of insensibility has been reached. In many cases this comes on very suddenly, but in others there are distinct prodromata, such as disinclination to exertion, dizziness, headache, confusion of ideas, oppression of breathing, and disturbance of special senses, especially of sense of sight.

A large number of cases reported by H. C. Wood, showed the following set of symptoms, which were quite constant:

Total insensibility was, as a rule, present, with, in rare instances, a talkative delirium, or, still more rarely, the patient could be partially roused by shouting.

Breathing was stertorous, and often accompanied by mucous rattles in the throat.

Face generally suffused, sometimes deeply cyanotic, as was the whole surface of body.

The eyes (conjunctivæ) were injected, pupils variable. Skin always intensely hot and generally dry, sometimes, however, covered with a profuse perspiration.

The intense burning heat of the skin, both as felt by the hand and recorded by the thermometer, was one of the most marked features of these cases. The temperature during life in most of these cases was from 108°–109° F., but it sometimes reached 112°.

The pulse is always very rapid; although at first it is often strong and full, later it may become irregular, thready, and intermittent.

The motor nervous system is profoundly affected; there is sometimes great restlessness, or partial spasms or general convulsions. Sometimes the motor system is paralyzed, the patient remaining motionless.

Hemorrhages into the skin or mucous membranes, evidencing broken-down blood, are sometimes present.

There is often a very peculiar odor about sunstroke cases, which to some physicians is quite distinctive.

Discharges from the bowels are often involuntary.

There is a form of insolation in which death results at once, and probably always by sudden arrest of heart action. This is rarely seen in civil life, but has been noticed among soldiers during battle, or at times when great exertion is being made, as during exhausting marches through hot, moist lowlands in India.

Post-mortem changes.—Owing to the excessive heat of the body, the temperature frequently rising after death, putrefactive changes are very rapid.

There is general venous congestion of all the organs.

The coagulability of the blood is impaired; it appears dark, often thin, sometimes grumous, feebly alkaline, or at times distinctly acid in reaction. Extravasations found in various parts of body and nervous system being due probably to the altered blood-crisis.

There are very many theories as to the causation of the phenomena of sunstroke. Perhaps the most probable is that of Wood, based on the theory of Letschenow. According to the latter, there is in the brain (Pons Varolii) a centre, whose function it is to inhibit the production of animal heat, and in the medulla, another part of the brain, another centre, probably vaso-motor, which regulates the dissipation of bodily heat. Wood, in an elaborate research, supports the truth of this theory, and points out that fever is due to a disturbance of these heat centres, so that more heat is produced than normal, and proportionately less thrown off. Now, supposing a man is placed in such an atmosphere that he is unable to get rid of the heat which his body is forming, the temperature of his body will rise, and he may suffer from a gradual thermic fever. If, early or late in this condition, the inhibitory heat-centre becomes exhausted by the effort which it has been making to control the formation of heat, or becomes paralyzed by the direct action of the excessive temperature already reached, then suddenly all tissues will begin to form heat with great rapidity, the body temperature will rise with a bound, and the man drops with some one of the forms of sunstroke.

If this theory be correct, says Wood, heat exhaustion with lowered temperature probably represents a sudden vaso-motor palsy, i.e., a condition in which the exhausting effects of the heat paralyzes the vaso-motor centres in the medulla, and not the inhibitory heat-centre, since experiments have shown that vaso-motor palsy increases enormously the loss of animal heat and diminishes its production.

In most cases of sunstroke death comes on gradually from arrest of respiration, which is probably due to direct paralysis of respiratory centre by excess of heat.

Allusion has already been made to cases of sudden death by cardiac arrest, which have especially been seen in India during a march or battle.

Diagnosis of insolation is generally easy. In distinguishing between simple heat exhaustion and true sunstroke the temperature is the best guide.

Prophylaxis against thermic fever consists in the observance of a few simple rules. If exposure to heat is imperative, the bodily health should be maintained by the avoidance of alcoholic or sexual excesses, and, as far as possible, of great mental or bodily fatigue. The diet should be simple, and the glandular apparatus of the skin, bowels, and kidneys kept active by the use of good fruit and water in abundance.

In mild cases of sunstroke the basis of treatment is the cold bath. It is customary here in New York, in hospital practice, to put the patient at once into a bath, and to reduce the temperature of same by addition of lumps of ice, the effect on the patient being carefully watched, and stimulants being given as indicated. Or the patient may be placed on a Kibbé cot, an ice cap applied to head, and the body sprinkled with cold water.

In severe acute cases of sunstroke, with very high range of temperature, it is essential that this should be reduced at once, and no time should be lost in waiting for the physician. As soon as a patient falls, he should be carried at once into the shade, his clothing removed, and cold affusions applied over chest and body. This must be done freely. In the larger cities the ambulances are often supplied during the "heated term" with ice and antipyrin, so that when the patient is reached no time need be lost in instituting proper treatment; many lives are doubtlessly saved by such prompt and efficient work. In using these various measures, such as the ice pack and cold bath, it must be remembered that the indication is the reduction of temperature, and the clinical thermometer affords the best guide to the effect of the treatment. Often little else is required. If, however, the period of insensibility has lasted too long before using these, consciousness may never return, even though the temperature fall to normal under treatment. These are very serious cases.

Sometimes after the temperature has been reduced in ordinary cases there is great tendency to relapse, and the same measures have to be repeated, the baths or some antipyretic drug being used daily perhaps for several days. Many persons who have been sunstruck suffer from after effects. In the mildest form there may be inability to bear heat without causing headache, dyspeptic symptoms, and failure of general vigor, with other indications of disturbed innervation. In other cases the symptoms are more

decided. Headache is generally prominent, and it may be almost continuous for weeks or months, though there are generally exacerbations. With this may be dizziness, loss of memory, and excessive irritability of temper.

One pathognomonic sign in the sequelæ of sunstroke is the effect of heat. The glare and heat of summer are, of course, the most trying, but usually even artificial heat is not well borne. It is not uncommon, indeed, for headache and severe general distress to be produced by entrance into a warm room even in winter.

SUOVETAURILIA, a Roman sacrifice, which was offered in nearly all cases of lustration and derived its name from the three animals of which it consisted, a boar (*sus*), a ram (*ovis*), and a bullock (*taurus*). In sacrifices to female deities, female animals were selected.

SUPERCARGO is an important officer in a merchant vessel, charged with the control of all her commercial transactions. The cargo is under his care, and he judges as to its disposal and replacement.

SUPEREROGATION, WORKS OF (Lat. *supererogata*, over and above things required), a class of works which, in the Roman Catholic system, are described as not absolutely required of each individual as conditions to his eternal salvation. Roman Catholics found this definition on the distinction between what they believe to be commanded and what they hold to be only counseled, for an example of which they appeal to the words of our Lord to the young man in Matthew xix. 21, which distinguish one class of works which are necessary in order to "enter into life," and a further class which must only be done if we "would be perfect." Roman Catholics do not profess to recognize in works of supererogation any distinctive essential quality by which they differ, whether in their physical or their moral entity, from other works, and in virtue of which, by their own nature, the individual may found upon them a personal claim to reward. For works of supererogation, as for all supernaturally good works, they hold that the assistance of God's grace is indispensably necessary; and they do not ascribe to them any merit, except that which arises from God's own free and gratuitous promise. In one word, the only distinctive characteristic of a work of supererogation lies in its not being supposed to be prescribed or commanded as absolutely necessary for the salvation of the individual, and its being done for the sake of greater perfection; and the doctrine which teaches the possibility of such works is, according to Catholics, a necessary consequence of the unequal fervor and unequal degrees of holiness which exist even in the class of the virtuous servants of God. A further consequence of this doctrine is that God may accept the superabundant works of one in atonement for the defective service of another; and hence, in the Catholic theory of indulgences (q.v.), along with what they regard as the infinite and inexhaustible treasure of the merits of our Lord, they also regard, although in a degree infinitely inferior, the superabundant merits of the saints as forming part of that "treasure of the church" which is applied in the form of indulgences.

SUPERFETATION, or the circumstance of two distinct conceptions occurring in the same woman at an interval of greater or less duration, so that two fetuses of different ages—the offspring possibly of different parents—may co-exist in the uterus, is a subject of great interest both in a scientific and in a medico-legal point of view. A couple of centuries ago, there was a universal belief in not only the possibility but the comparative frequency of this occurrence. Fifty years ago, it was as universally disbelieved; and now again (owing to the investigations of various inquirers, among whom Dr. Bonnar of Cupar deserves special mention), we are returning to the belief of our ancestors. The cases described as instances of superfetation may be arranged in three classes; but as will be presently seen, it is only to the cases of the third class that the term superfetation is truly applicable. The *first class* includes the numerous undisputed cases in which two mature children, bearing evidence, from their different colors, that they are the offspring of different parents, are born at the same time. In the slave states of America, it was by no means uncommon for a black woman to bear at the same time a black and a mulatto child—the former being the offspring of her black husband, and the latter of her white lover; and the converse has occasionally occurred—a white woman at the same time bearing a white and a mulatto child. There is no difficulty in accounting for these cases, which are examples of contemporaneous conception rather than true superfetation. The *second class* includes those cases in which a twin has been aborted, leaving its fellow undisturbed in the uterus, to be matured and born in due time, or in which twins have been produced at the same time, one of which was fully formed, while the other was small and apparently premature, from being "blighted" or arrested in its development at an early period. Cases of these kinds are by no means rare; but there is no reason for believing that the infants were conceived at different periods. The *third class* includes the cases in which a *mature* child has been born, and an *immature* fetus, the product of a different conception, has either been left in the womb until its period of maturation, or, if expelled along with the other, has presented no mark of wasting or of arrested development. "In a case of genuine superfetation."

says Dr. Bonnar, "a woman must bear two (or more) mature children, with an interval of weeks or months between the birth of each; or, if she part with the whole contents of the uterus at the first delivery, the difference of the ages of the fetuses, or the mature child and the fetus, as the case may be, must be unmistakable, and there must be the absence of all marks of blight of the latter, so as to leave no doubt that, had it remained in utero, it would have gone on to perfect maturity." Among the cases of superfetation that have been specially discussed by writers on midwifery and medical jurisprudence, are the following: (1) Velpeau quotes from the *Recueil de la Société de Médecine* the case of a woman named "Arles," who, in 1796, gave birth to a child at the full time, and five months afterward to another, which was also thought to be at the full time; (2) Dr. Maton, an eminent London physician, communicated to the college of physicians the case of Mrs. T——, an Italian lady, who was delivered of an apparently healthy and mature male child on Nov. 12, 1807, but which lived only nine days. On Feb. 2, 1808, or 82 days after the birth of the first, she was delivered of a second child, which likewise had every sign of being completely formed and mature. The following case, which, as Dr. Bonnar (in his *Critical Inquiry regarding Superfetation*, Edin. 1865) observes, "has been the principal battle-field of the advocates of superfetation and their opponents," and has given rise to more discussion than any other, is recorded by Dr. Desgrange of Lyons. Madame Villard had a miscarriage at seven months on May 20, 1779. In about a month thereafter she conceived again, and on Jan. 20, 1780, she brought forth a living child. No milk appeared in her breasts, the abdomen did not seem to diminish in size, and other symptoms which normally follow delivery were absent. The two surgeons who were in attendance being naturally puzzled, called in Dr. Desgrange, who declared, in opposition to their views, that there was still a child in the womb; and his opinion was confirmed by her being delivered of a living child on July 6, 1780, 167 days after the first birth. Dr. Bonnar has collected from *The Peerage* a number of cases of probable superfetation occurring in married life. Excluding a very few exceptional cases, he adopts Dr. William Hunter's view, that 210 days, or seven calendar months, is the minimum period of uterine life at which a child should be born in order to be reared, and he assumes that no prolific intercourse can take place until at least fourteen days after the first delivery.

SUPERIOR, city, port of entry, and co. seat of Douglas co., Wis.; on lake Superior, and the Chicago, St. Paul, Minneapolis, and Omaha, the Duluth and Winnipeg, the Duluth, South Shore, and Atlantic, and the Northern Pacific railroads; opposite Duluth, Minn. The city is locally divided into parts known as East, West, South, and Old Superior, but all are under one government. Superior contains a state normal school, two high schools, St. Francis, St. Mary, and the W. C. T. U. hospitals, public library, electric light and street railroad plants, waterworks supplied from lake Superior, excellent sewerage plant, national and state banks, and numerous churches. The city being laid out originally for a great commercial port and having a harbor that has been improved at a cost of over \$7,000,000 by the federal and city governments and private corporations, is well equipped for the position it occupies. There are numerous grain elevators, coal docks, flour mills, ship-yards for building whaleback steamers, the largest dry dock on the great lakes, and iron and steel works. The commercial receipts include large quantities of coal, lumber, iron, ore, cement, and salt, and the shipments comprise grain, flour, lumber, coal, copper, and the general products of the region tributary to the city. Pop. '90, 11,983.

SUPERIOR, LAKE, the largest body of fresh water in the world, is the highest and most western of the great lakes lying between West Canada and the United States. It is situated not far from the center of the North American continent. Its general form is nearly semi-lunar, the outer curve being towards the north. Greatest length from e. to w., 390 m.; greatest breadth, 160 m.; area, 31,420 sq. miles,—fully that of Ireland. The surface of the lake is about 600 ft. above the level of the sea, and its mean depth 1000 ft., so that its bottom is 400 ft. below the level of the sea. Its surface has an elevation of about 22 feet above that of lake Huron and lake Michigan. The greater portion of this rise is at the Sault Ste. Marie, a strong rapid about a mile in length, at the commencement of the river St. Mary, which transmits the waters of lake Superior to lake Huron.

Lake Superior, being situated very near the water-shed between Hudson Bay and the Mississippi, receives no rivers of importance, although hundreds of small rivers pour themselves into it. The largest are the St. Louis river, which falls into its western extremity at Fond du Lac, and is about 110 m. long; and the Neepigon river, on the n. side, which, with the lake of the same name, has a length of about 200 miles. One of the branches of the Mississippi in Minnesota approaches to within 20 m. of the western extremity of lake Superior; and a small lake near the head of the Albany river, of which the waters flow to Hudson Bay, is only 4 m. from a bay opposite the State islands on the northern shore, forming a route with little portage, which has long been used by the Hudson Bay company, for the conveyance of goods from lake Superior to the northern country.

The promontory Kee-wee-naw, near the middle of the s. side, projects far into the lake. The islands are not numerous, the largest being Isle Royale, 44 m. long.

The country around lake Superior is generally bold and hilly, with the exception of the peninsula lying between it and lake Michigan; but few of the hills rise more than 1000 ft. above the level of the lake, and most of them are far below this height. On the

southern shore, 100 m. w. of the Sault Ste. Marie, are the Pictured Rocks, cliffs of gray and red sandstone, from 100 to 300 ft. high, in many places presenting fantastic forms, and marked by numerous perpendicular stripes of red and yellow, from ferruginous waters trickling down the face of the rock.

The boundary between the United States and West Canada, starting from the outlet of the lake at the Sault Ste. Marie, sweeps toward the n., so as to include in the United States even the Isle Royale, which is only 13 m. from the British coast, and strikes inland from the mouth of Pigeon or Arrow river, on the n.w. shore.

The only obstacle to navigation between lake Huron and lake Superior is the Sault Ste. Marie, which is overcome by canals and locks on the U. S. and the Canadian sides. They are, perhaps, the finest canals in the world. The locks are admirably contrived, and the largest ships can pass through with ease. The trade has increased rapidly since the completion of the canals.

The water of lake Superior is remarkable for its coldness, purity, and transparency, although the affluents on both sides are either turbulent or deeply colored by vegetable matter from swamps and forests.

A rise or fall in the level of the water, amounting to several inches in a few hours, is frequently to be observed along the shore, and has been supposed to be due to a regular tide, but is probably caused by the wind. Fresh water being more easily moved by the wind than salt water, great waves arise in lake Superior with wonderful rapidity; and even in summer, large steamers are compelled to take shelter in some bay, or under the lee of an island. Owing to the low temperature of the water, compared with that of the air, in summer, fogs are prevalent, resting on the water at night, and vanishing an hour or two after sunrise.

Lake Superior never freezes over, but the bays are sealed up in winter, and a rim of ice extends to some distance all around the shore.

The rocks around the lake are very ancient, belonging principally to the Laurentian and Huronian systems of the Azoic series, overlaid in some places, especially on the s. side, with patches of the lower Silurian. The prevalent Laurentian rock is orthoclase gneiss. Among the Huronian rocks are greenstones, slates, conglomerates, quartzites, and limestones. The lower Silurian rocks are soft sandstones. There is everywhere much evidence of glacial action.

The Huronian rocks are well stored with useful minerals. The copper and iron mines of the s. side are celebrated for their extent and richness, and there is every reason to think that the mineral resources of the British side are equal to those of the American, although as yet comparatively undeveloped. The richest copper-mines are situated near Kee-wee-naw point. The metal occurs principally native, and sometimes in single masses of great size. One was met with in 1853, which measured about 40 ft. in length, and was calculated to weigh about 400 tons. Native silver is found associated with the native copper, and sometimes intimately mixed with it. A rich vein in an islet in Thunder Bay (British side) yielded in 1870-73 silver to the value of \$1,230,000. Gold has been found in small specks at Namainse on the British side. Lead ore occurs in some places. The beds of hematite, or red iron ore, at Marquette, on the s. side, are of wonderful extent. The ore is conveyed by rail and water to cities in the United States, where it is smelted.

SUPERPHOSPHATES. See PHOSPHORUS.

SUPERSTITION. The origin of this word has occasioned much controversy, as it is involved in the mystery of the ages, but it is generally accepted as a strictly Roman word, for which the Greek had no synonym. We owe to Cicero (q.v.) its true signification, which has recently been rescued from the oblivion which has obscured it for ages namely, "standing over," or "surviving," and thence it signifies something remaining after a change, by which it might possibly have been destroyed. Those who escaped in battle or survived death, were called *superstitēs*, *superstitiōs*, or survivors. Cicero says "they who prayed all day that their children might over-live them" were called *superstitiōs*. Lactantius objects to this derivation, but says the word gets its meaning from the worship of deceased parents and relations, by the *superstitēs* or survivors, or from men holding the memory of the dead in superstitious veneration. Thus Cicero and Lactantius agree in connecting the origin of the word with the relations between the dead and the living who *survive* them. Cicero gave it his sanction when he wished to consecrate the image of his dead daughter to the gods, whom he did not hesitate to affirm were men who had survived death. In any case, the word originated in some mysterious connection between the dead and the living, the deceased and those who survived, the world that is seen and the world that is unseen; whether it might be that it arose from the "Promise made to the Seed of the Woman," and it was considered a great misfortune to die childless, or to survive one's children; or that the death of one person might be influenced by the death of another. The word "survival," then, best defines "superstition," meaning the remainder or residue of something gone before, although it has long received a different signification, namely, that of being in excess, over-scrupulous, exact, and it cannot be denied that this secondary sense, did, from an early period, influence the acceptance of the term, until, at length, it superseded the primary sense.

and was received as the true germ and original idea of superstition. Being comprehended in the same word, this sense of scrupulosity, idle ceremony, and superfluous care, overestimating trifles, which underlies all superstitions, finally swallowed up its obscure and mysterious origin involved in the relations between the dead and the living. But the word "survivals" may be used in a broader sense than "superstitions," as the latter is practically confined to things appertaining to religion, while "survivals" may indicate habits, or expressions inexplicable by the light of our present advanced ideas, but easily explained by reference to similar customs or prejudices still to be found among distant tribes and mentioned by ancient writers. Thus a word which originally signified merely those religious delusions which "survived" the influence of advancing civilization came in process of time, by a kind of historic metonymy, to denote the brutalized ignorance, the unobservant credulity, and the unreasonable awe by which these errors were distinguished; and objects unworthy of reverence were accorded a kind of religious veneration, and the true God was worshipped through improper rites and ceremonies, and His divine will was announced by omens.

Until recently, wise men have only looked askance when the subject of superstitions was mentioned, but now in England, Germany, Bohemia, China, and America men of learning have set about collecting documents on this subject, as they now regard them as the wrecks of former beliefs over which centuries have spent their storms. "Survivals" have been aptly called "milestones on the way of culture." Many theologians unite in defining religion to be the feeling which falls upon man in the presence of the Unknown. Man naturally fears what he does not understand, the unknown may bring danger to him, and all the future is hidden in the unknown. Under strong excitement Man has personified the Unknown and that personification he sought to propitiate when he offered sacrifices to the shades of his ancestors and commanded the burial of their bodies that their spirits might rest in peace. ANIMISM (q.v.), in which all the powers of life and nature were attributed to the spirits of those who had gone before, constituted the lowest form of superstition; hence arose the feeling of veneration among the earliest savage tribes with which their ancestors were always regarded, and the facility with which hero-worship developed into a religion in the minds of the simple *pagani* (country folk), already alive to the fear inspired by the phenomena of nature and the grandeur of the elements. This first semblance of religion, gradually, by mere observation and experience, was converted into the belief in a superintending being long before Revelation had made known the benevolent system we have now. But, necessarily, the progress was gradual, and at every stage, the peoples, as they advanced in knowledge, were enabled to look back upon those barbarous sections who still lingered behind, called *superstites*, and to discern the remnants, *superstitia*, of that ignorance and fear from which the most degraded had not wholly emerged. The question arises whether any tribes have ever existed, destitute of a form of what may be called religion. If not, it might have been so much mixed up with superstition that those who criticise sharply and maintain that superstition is the reverse of religion, as well as morals, asserted that the country-folk practised SHAMANISM (q.v.) under the guise of religion.

Traces of superstition or prehistoric religion may still be found in every part of the world, in the heart of civilized Europe, where many of its crude and grotesque customs still practised are very similar to those of China, central Asia, dark Africa, and Australia. How can this prevalence of the same ideas be explained? Does it prove that communications between distant members of the human family were more frequent than we have always supposed, or that we have all sprung from a common stock? Or may we credit the fact that men have similar beliefs because they have similar minds? We know that Superstition took its rise very early in the world and soon spread itself all over the face of the earth, and few, very few, were there who were wholly free from it. The mischiefs it has produced are well known—gods of all sorts and kinds, sacrifices of beasts and men; rites, ceremonies, absurd tricks, and cruel torments, with every other thing which from all time has been falsely called by the name of religion, have arisen from hence. The doctrine of the divine Jesus was calculated to destroy its influence and cause religion to glow with a new light, but superstition soon found an entrance among Christians, and increased and remained in spite of the Reformation (q.v.) and the revival of letters, and even showed itself among those who rejoiced that they were free from the Papal yoke. The form which superstition has assumed throughout the dim ages of the past, before revelation of the true God arose, leaving hideous wrecks strewing its pathway, as it heralded the advance of civilization, were so many and so varied that the mind of the present day shrinks with horror at the contemplation. The belief in apparitions (q.v.), brownies (q.v.), elves (q.v.), fairies (q.v.), ghosts (q.v.), or spectres has prevailed in connection with supernaturalism from the earliest ages, and has not died out with the light of the nineteenth century. It arose with the dawn of the world, and has lived despite all persecution. In the same category may be mentioned the following subjects, to special articles on which reference is made: Amulet, Astrology, Augury, Auspices, Cabbala, Demoniacs, Demons, Divination, Evil Eye, Exorcism, Horoscopes, Incantation, Lycanthropia, Magic, Mandrake, Mascot, Necromancy, Oracle, Ordeal, Possession, Rhabdromancy, Seers, Sorcery, Sortilege, Talisman, White Lady, and Witchcraft.

Gradually there arose above the reverence for the spirits of the air and hero-worship an idolatry for the objects and phenomena of nature, and the Sun, Moon, and Stars gave rise to Zabism (q.v.) in some countries, Totemism (q.v.), Shamanism (q.v.), and Lamaism (q.v.). Folk-lore (q.v.) is a science of itself. During the middle ages, for centuries, thaumaturgy, or the study of the supernatural, was almost universally popular, and in every part of the world the magician and the sorcerer vied with the priest in the practice of their arts, until all the better qualities of the human mind were well-nigh suffocated with the noxious weeds. Many venture to affirm in their innocence that the days of superstition are past. How little do they know of what they affirm, concerning the belief, not only of the so-called uneducated class, but of those who it might be supposed from their station and education would rise above such influences. And this is true of the old-fashioned belief in ghosts, wizards, and uncanniness; which still prevails. To this fact the daily papers bear witness, when they publish the account of some wretched old woman being dragged before the judge, for pretending to tell fortunes with a dirty pack of cards, or the dregs of a teacup, and yet, with human inconsistency, the legislator permits the turf-touters to advertise their superstitions, and allows the wise man to cure warts, toothaches, and certain cattle-diseases by incantation. How common to find the rustic apply to the charmer to have his toothache cured, not understanding the well-known effect of a visit to the dentist upon the nerves. The rumor of a haunted house is a source of joy to a whole neighborhood, as it immediately becomes the centre of curiosity. And many times, in the opinion of the rustics, the ringing of the bells, or the fancied apparitions, are owing to the fact of the bones of a human body lying unburied in some part of the house, thus recalling even at the present day the old obligation of burial of ancestors, to assure peace. CHIROMANCY (q.v.), or the art of foretelling the future by the hand, is a science of antiquity recently revived in fashionable circles, and it retains all the superstitions attached to it in the past. All secrets are revealed by the lines in the palm of the hand, and besides, the thumb is given to Venus, the forefinger to Jove, the middle finger to Saturn, the ring finger to Sol and the little finger to Mercury. "Little finger tell me true," is a French proverb used by Molière (q.v.) in his *Malade Imaginaire*, when a French gentleman of renown wishes to question his little daughter respecting a young man who visits her elder sister and he says to her: "Be very careful there, because here is a little finger which knows everything and will tell me if you deceive." When the child has told him all she knows, he puts his finger to his ear, and says: "There is my little finger, yet which mutters something. Listen! He! Ah, ah! yes? Oh, oh! there is my little finger which tells me something that you have seen and that you have not told me." To which the child replies: "Ah, my papa, your little finger does not tell the truth!" But there are many other sciences besides Chiromancy. SCAPULAMANCY is still practised among the tribes of Central Africa and Asia. It is built on lines, but they are the cracks on the blade-bone of a shoulder of mutton. CAPNOMANCY foretells the future from the rising smoke, and by pyromancy it can be read from fire. ÆROMANCY augurs from the breeze and clouds, and hydromancy from the water. Even by the waves of the sea can be told the visions of the future. In ancient times the Spirit troubled the water, and the clew was found in the lines produced. If the Spirit was an evil one, all things were read backwards. Later, a ring was hung by a thread over a glass and shaken, and the message was given by the strokes on the glass; or three pebbles were thrown together in a well, and the future read from the figures caused by the widening circles. PALOMANCY is divination by fountains, into which loaves of bread, dice, etc., were thrown. At Palicorus, in Sicily, was a celebrated fountain, and Ino's, near Epidaurus, is well known in history. Among the Germans the rapids and eddies of running water were made to divine the future. CATOPTROMANCY foretold by means of mirrors a development of hydromancy, for the first mirror was the water. In one form a mirror was let down into a well, until it touched the water, and the answer was given by the reflection from both. In SCYPHOMANCY a drinking cup was used. When the foundations of Persepolis were laid there was found the cup of Djemscheed, full of the elixir of immortality, and in this cup the Persian told how the whole world was shown; and while it was possessed the Persian empire flourished. When Seringapatam was stormed Tippoo Sahib retired in the midst of the battle to consult his divining cup and from it he fled in terror to die in the breach. Sometimes a drop of oil was floated on the surface of a bumper, thus forming the mirror on which the images would appear. Sometimes the oil would give place to treacle in a cup, or ink in the hand, which formed a connecting link with crystallo-mancy in which the seeker gazed into a transparent body. From Catoptromancy the transition was easy to divination by crystals, glass, etc. CRYSTALLOMANCY is practised at the present time, and spheres and eggs of quartz and glass prepared for the purpose, can be seen in the shop windows. Rock crystal, however, is a modern innovation, as the favorite stone in the past was beryl. "There are certain formulas of prayer," says Aubrey, "to be used before they make the inspection, which they term a call; these calls are always to be used, as nothing will appear in the crystal without." ONOMANCY was used by the Greeks, and was a science that depended upon the number of vowels in a name. If the number was odd, something was the matter with the right side. A curious story is told of the Goth, Theodotus. When he was about beginning his fight with Rome, in order to discover the

result, he gave names to thirty pigs, half being Roman, half Gothic, and in three different styes he locked them up, five Romans and five Goths in each. When the styes were opened, all the Romans were alive with half their bristles off, but all the Goths were dead. The signification was clear—the Goths would be beaten, but the Romans would lose half their force. MYOMANCY made use of the sounds and damage done by rats. The great dictator, Fabius Maximus, resigned his dictatorship because the squeal of a mouse warned him to do so. And for a similar cause Cassius Flaminus threw up the command of the cavalry. The bite of a rat was fatal to success, but Cato was equal to the occasion, when he replied to a soldier who came to him in terror, saying a rat had gnawed his shoe: "Would it not have been strange if the shoe had gnawed the rat?" ORNITHOMANCY, which depended on the habits of animals, was a branch of augury which was much practised by the ancients, and consisted in waiting for the flight of a bird. A hawk betokened victory, an owl, misfortune. If the bird flew to the right hand it meant good fortune, if to the left, evil. The call of the bird was also ominous. If chickens came slowly to their feed and pecked the corn about, misfortune was in the wind, but if they rushed ravenously to the grains all would be well. In ELECTROMANCY a white cock played the chief part by pecking a grain of corn or wheat off certain letters, his choice spelling out the future. A somewhat similar method was by DACTYLOMANCY, where a round table was divided into spaces, each having a letter, and over it a wedding ring was hung by a thread, its swing giving the letter forming the message from the spirit world. AXINOMANCY was also dependent on the direction of the unseen force and was used for the detection of guilty parties. GYROMANCY detected the guilty party by causing an innocent boy to run round and round until he was giddy, and fell opposite the letters containing the name of the culprit. CARTOMANCY tells fortunes by the use of playing cards, COSCINOMANCY by a sieve which is hung and tells tales by turning, and ONYCOMANCY depends upon the spots on the finger nails. In CLEDONISMANCY the first words uttered by friends when meeting gave the necessary indication as to coming events. In CLIDOMANCY a key was tied to the Bible and hung on a maid's ring finger, the key being found to move when the guilty name was uttered. For GEOMANCY pebbles were used; while in LITHOMANCY a particular stone was taken, and it is not unlikely that ventriloquism was brought into action and that in GASTROMANCY "deep whispers came from corporeal depths." "When Saturn thought he was devouring Jupiter, he was merely chewing a *betulum*, which was a rounded stone which fell down as a globe of fire, and the terrified observer saw that it was guarded by a lion. A learned doctor picked it up and it proved a mine of wealth."

ALEUROMANCY was a test of innocence by means of a piece of bread or cheese an ounce in weight, cursed to kill if guilty, which the accused had to swallow; barley bread was preferred, as being more likely to choke. In RHABDOMANCY two staves were set up and talked to, until one or both, under the incantation fell down, the position giving the expected sign. In BELOMANCY arrows were drawn on which were the names of cities it was thought advisable to attack. In HARUSPICATION the victim was slain on the altar and the future read from the twist of his entrails. "If frogs by croaking," Cicero makes his Stoic say, "can give us signs to foretell the weather, why should there not be omens in the fibres of a victim's entrails?"

Among the Zulus of Africa, at the present day, the belief in magic and sorcery still reigns supreme, and its influence is utterly demoralizing. Wizards and witches may produce their enchantments from a foot-print, or from the impress of the body in sitting or lying upon the ground. The finger-nails and hair, when cut, must be carefully kept and buried. Each sorcerer pretends to get his communications directly from the spirit-world and delivers them in the form of riddles or dark parables. They have a potion in use among magicians, which, when taken, enables a man to influence another at a distance simply by willing. And this gives them immense power, together with the force of custom, so that, although their predictions may fail, thieves may go unpunished, rain may not fall, patients may die, the magicians still remain a sacred order, and every failure is explained away, and the fetters of custom continue unbroken. It is interesting to note that Africans never speak of a man as dead; and the same thing may be observed in Scotland; they say, "He is taken away," or "He is not here." If a man has a narrow escape from death, he says, "My father's soul saved me." Although they have a superstition about spirits inhabiting caverns, roofs of houses, and other places, yet their general belief is that the spirit, at death, goes directly up to the spirit-land. Ancestor worship is not only their religion, but they actually regulate their whole life by it. They have a class of spirits corresponding to the fairies and brownies of England and Scotland. Among the negroes of Washington there exists a superstition, that oftentimes, at midnight, there rushes through the streets a supernatural being formed like a man, having long, hook-like fingers and a poisonous breath. Whenever he turns and breathes upon a house where a child lies sick, the child is doomed to death before another night. The *night-doctor*, as he is called, is only ominous when seen not heard. It is a common thing for the negroes to get together and inquire of each other who has heard him, and some one is sure to assert that he or she heard the low, moaning, rushing sound, as he passed during his flight. Sometimes, at midnight, negroes who are in the street will suddenly stop,

turn their faces to the wall, and stand with their hands over their eyes, as they fancy they have heard him pass, and, if they turn, he will blow his murderous breath upon them. The superstition concerning the CHILD'S CAUL is very old, and came originally from the East, several words in Arabic being found to express it. The caul is a membrane found on some children, encompassing the head, when born. This is thought to be a good omen for the child itself, and in Scotland is believed to carry with it the gift of second sight. The vulgar opinion is, that whoever obtains it, by purchase, will be fortunate and escape danger. Hence it is often advertised for sale, the price being about twenty or thirty guineas. It is an infallible preservation against drowning, hence seamen often become the purchasers. The superstition was very prevalent in the Middle Ages, even in the church, and Chrysostom inveighs against it, in several of his papers. In France it is proverbial, *Etre né coiffé*, signifying, "born with a caul," indicated extreme good fortune.

The superstition concerning WELLS and FOUNTAINS is of the most remote antiquity. They were supposed to impart virtues of many kinds, and the implicit faith in them is not yet extinct. The devoted would spend hours in them, standing in water up to their chins, sending up their prayers, or performing a number of evolutions round the polygonal well. The bathing well of Whiteford had a large stone, two feet beneath the water, which received many a kiss from the faithful, who never failed, it is said, to obtain their desires, provided they were offered with faith. Scotland furnishes many instances of wells superstitiously believed to have the power of imparting health and blessing. Near the parish church of Kirkmichael, in the county of Banff, is mentioned a fountain over which a guardian angel, in the form of a fly, formerly presided, and love-sick maidens and sober matrons flocked there to watch the motions of the fly. A singular phase of this superstition was leaving shreds and bits of cloth around the well to receive the blessing; these could afterwards be removed for the cure of diseases. This custom was not confined to England and Scotland, it was also common on the continent. To such an extent was it carried, that it was forbidden by the sixteenth of the canons issued in 960 by Edgar, and it was also condemned by the canons of St. Anselm in 1102.

Among the popular superstitions which the civilization of modern times has not been able to obliterate, that of the DEATH WATCH still maintains its hold. It has long been credited with predicting a death in the house where it is heard. Investigation has shown that the monotonous raps are caused by a small insect belonging to the timber-boring tribe, which is not discernible, being of the same color as a tree. It is the signal of the male to the female, made by tapping its head against the wood, strokes from nine to eleven in number, and then a pause.

SUPERSTITIONS OF THE MOON. The moon, which was an ancient object of idolatry, has in later times become an article in the creed of superstition. The ancient Druids had their customary rites and ceremonies at the changes of the moon, and these have had great influence among the rustics. The custom of addressing the new moon for the purpose of getting information as to the future husband or wife is one of the commonest prevalent, as, for example :

"All hail to thee, moon, all hail to thee,
I prithee, good moon, declare to me
This night who my husband shall be."

A dream is expected to follow in which the future spouse will be revealed. The Man in the Moon is supposed to have originated in the ancient account given in the book of Numbers, XV. 36. of a man punished with death for gathering sticks on the Sabbath day. In Ritsin's *Ancient Songs* we read the Man in the Moon is represented leaning upon a fork, on which he carries a bush of thorn, because it was for picking a stake that he was punished. In *A Midsummer Night's Dream* the Man in the Moon is personated by Peter Quince, with his lantern the moon. The Man in the Moon is a source of wonder to all children, to whom he is shown in connection with the nursery rhyme, "The Man in the Moon came down too soon." Different countries have different legends to account for his presence there. One widely extended, and alluded to by many writers, says that a man, while traveling along on Sunday, with a bundle on his back, was met by a fairy who asked him why he worked on Sunday. He replied, "Sunday on earth or Monday in heaven, it is all one to me." "Then bear your bundle forever, and as you have no regard for Sunday on earth, yours shall be a perpetual Monday in heaven, and you shall travel for eternity in the Moon." There he remains to this day. In some legends he has a companion, a woman with her butterfly, who was transported thither because she made her butter on Sunday. The Scandinavian mythology relates the story of two children that the moon stole and carried up to heaven. They had been drawing water from a well in a bucket, which is seen in the Moon, suspended from a pole on their shoulders. This recalls the nursery rhyme of *Jack and Jill*. The fall of Jack and the subsequent fall of Jill, simply represent the vanishing of one moon spot after another. April is called the Moon of bright nights, May the Moon of leaves, June the Moon of Strawberries, September, of falling leaves, and November the Moon of Snow-shoes. Astolpho reckoned the Moon to be the great depository of misspent time, wasted wealth, broken vows, unanswered prayers, fruit-

less tears, abortive attempts, unfulfilled desires and intentions. Bribes, he tells us, were hung on gold and silver hooks; princes' favors were kept in bellows; wasted talent was stored away in urns; but every article duly labeled. The Buddhist legend places a man and a hare together in the Moon.

It is generally acknowledged that the Americans, as a class, are inclined to be superstitious; but a visit to the race-track reveals the fact that no part of the community submits more willingly to the impositions upon its credulity, than the gamblers of the turf. Cross-eyed men and women, black cats, and HOODOOS, in the shape of acquaintances, jockeys, owners, and bookmakers, all are objects of the gambler's suspicion for good or evil. Some believe that they are more successful in picking the right horse, if they wear some particular article of dress—a certain scarf-pin or umbrella. One successful "plunger," who has made a fortune of \$16,000 on a single race, pins his luck into his scarf, in the shape of a small gold horseshoe, and would not part with it for any money. Another believes his luck lies in a switch-like cane, much resembling the branch of an apple tree. A celebrated pugilist, who turned his attention to the turf, firmly believed in the wonderful winning powers of an old blue serge coat, contrasting strangely with his tasty clothing. A hunchback is believed to possess peculiar qualities, and many derive a comfortable income from the privilege accorded to gamblers of rubbing their shoulders, at twenty-five cents a piece. Every follower of the races firmly believes in a "Jonah," and there is always a considerable amount of dodging to avoid an encounter with any one looked upon as such. Dreams are regarded as infallible in their predictions with this class of people; many betting solely upon the horses indicated in their dreams. The superstitions of actors and actresses are well known. A celebrated singer will never go on the stage for an opera, without causing each person she meets, on leaving her dressing-room, to go through a curious performance. If it chances to be one of the actors, or even a super, whom she first encounters, she causes him to hold up his thumb in front of her, then placing her thumb on his, she turns her hand around, at the same time pressing downward. If the thumb upon which she presses is held firm, she is satisfied, but if it gives way, it is a sign she will break down during the performance. A brilliant young actress of New York looks upon a battered old silver spoon as her *MASCOT* (q.v.), because when discouraged by her lack of success, one morning, she picked it out of a refuse box, and immediately thereafter procured the engagement which was the success of her life.

LUCK OF HORSESHOES. The superstitious custom of nailing a horseshoe to the threshold of the door, is one of the most common that has extended to the present day. The shoe, to insure the highest luck, must be found after it has been cast from the horse, and is supposed to possess the magic influence of hindering the power of witches, who might otherwise enter the house and work their spells, bringing ill-luck to the inmates. Many of the houses in the West End of London have a horseshoe on the threshold, and in Monmouth Street alone, at one time, might be counted seventeen. Churches, even, were not exempt from the superstition, for in 1797, under the porch of the Stanfield church, might be seen a tile with a horseshoe upon it, and similar instances might be mentioned. The great Nelson (q.v.) being very superstitious had great faith in one which he had pinned to the mast of his ship, the *Victory*. At the present day the horseshoe is placed over the door.

The custom of throwing a shoe after persons newly married, or servants entering upon a situation, is believed to be efficacious in bringing good luck to them. It is a question whether it was originally thrown for luck only, as we find it stated in the Scriptures that it was necessary to receive a shoe when executing a contract, as an evidence or symbol of assenting or accepting, dominion or ownership; giving back the shoe indicated rejecting or resigning it. See passages in Deut. XXV. and Ruth. Probably throwing a shoe after a bride was a symbol of renunciation of dominion and authority over her by her father or guardian; and the receipt of the shoe by the bridegroom even if accidental, was an omen that the authority was thus transferred to him. Many old farmers imagine they can foretell the weather from the number of dark spots around the sharp keel of a GOOSE-BONE. The darker the spots the colder the weather is to be. It is very common when our ears tingle, or our cheeks burn, to say that some one is talking about us, and this is a conceit of great antiquity, since it is mentioned by Pliny (q.v.) as a superstitious notion, that a universal Mercury, or signifying genius, conducted sounds to his distant subjects, and taught them to hear by touch. The bleeding of the nose is also an ancient omen of illness or death. **SPITTING** was a charm against fascination among the Greeks and Romans, and in Naples, even at the present day, the traveler may see the native spit upon the ground or extend his fingers to imitate horns, if he or she meet a *jettatore*, or a person supposed to be capable of exerting the influence of the **EVIL-EYE** (q.v.). Pliny says it averted witchcraft and availed in giving a sure blow. Boys are often seen spitting upon their hands for luck, and boxers and fish-women have the same custom. The **SERPENT-CHARM** superstition still holds its own, and it is probably only an outcome of the evil-eye, which in mediæval Italy ranked almost as an article of faith. In the same country, poison-mongery early attained the perfection of an exact science. In Naples there were experts who could specify the day when a tincture, "*Aqua tefana*," repeated in a certain number of Joses, would cause

death. It will hardly be credited that thousands of people recently crowded a certain road in the village of Melling, near Ormskirk, England, to inspect a sycamore tree which had burst its bark, and the sap protruded in a shape resembling a man's head. Rumor spread abroad that it was the reappearance of Palmer, a noted criminal, who had come again, because he was buried without a coffin. Almost the same superstition repeated, of thousands of years ago.

The superstitions of the people whose homes are by the sea, have been handed down from generation to generation, until they have finally become a part of their lives. In the fishing villages along the New England shore, it is a common belief that a person lying ill cannot die except on the ebb of the tide. Two of the most celebrated haunted spots are the north-eastern coast of Block Island and St. Mary's Bay, near Cape Race, Newfoundland. Here ghosts of phantom ships which have been wrecked or burned are said to be seen, not only by the superstitious villagers but by men of standing from Boston and New York. J. G. Whittier (q.v.), in his *Tent on the Beach*, mentions "the terrible ghost of Palatine" seen on the Block Island Beach. The legend of the spectral fishing fleet of St. Mary's Bay is as recent as 1862, when a hundred smacks went down in storm-tossed waters, and their ghostly forms are often seen at night. There have been occasions when much excitement on the subject of religion has prevailed, and strange nervous disorders have developed themselves among the people, which have been interpreted as immediate visitings of the Holy Spirit. This interpretation was delusive and the belief in it is superstitious. A very recent instance of this has occurred among the Indians in the neighborhood of the Cheyenne River, in the United States which, taking its rise in the visions of their "seers," ended in a ghost-craze dance extending over a large territory, through many villages, and from one tribe to another. They spread the news of the second coming of Christ and affected the Christian as well as the pagan Indians. Similar excitements or crazes have been noted at different periods among the North American Indians and also among the negroes, as well as in Siberia and various parts of Europe.

In the days of Pliny (although he loses no opportunity of laughing at the superstition) the Magi ascribed extraordinary supernatural properties to GEMS and to various figures engraved upon them. As civilization declined these notions came more and more into vogue, so that even a learned physician, Alexander of Tralles, recommended the wearing of the intaglio of Hercules strangling the Nemean lion, as a charm against the colic, and such intaglio do occur inscribed with four K's, to make assurance doubly sure. Gnostic stones frequently present inscriptions specifying the part of the body they were intended to protect from malignant influences. These "stones of virtue" were believed to have been engraved in the "times of the Israelites," a notion no doubt grounded upon the Hebrew words so frequent on the Gnostic intaglio. It was believed that stones having a form, derived a virtue from being cut into a special form and that they were likewise subject to the universal influence of the planets. By the engraving upon a gem its virtue was directed to a certain determinate effect, hence its influence was strengthened; and to be effective it was done under certain circumstances, and at a certain hour when the planet was strongest. The Diamond has the virtue of resisting all poisons, yet if taken inwardly is itself a deadly poison. It baffles magic arts, dispels vain fears, and gives success in lawsuits. The Chalcedony, if blest and tied around the neck, cures a lunatic; moreover, he that wears it will be drowned or tempest-tossed. It also makes the wearer beautiful, faithful, strong, and successful in all things. Aristotle says that an Emerald hung from the neck, or worn on the finger, protects against danger from the falling sickness. It is very highly approved in all kinds of divination; in every business, if worn it increases its owner's importance both in presence and in speech. A Sard of the weight of twenty grains of barley, if hung around the neck or worn on the finger, will guard the wearer against terrible dreams, and he shall have no fear of incantations or witchcraft, and shall be beloved by women. The Beryl is a large transparent stone. Upon it should be engraved a lobster and under its legs a raven; put under the gem a vervain leaf enclosed in a little gold plate. It being consecrated and worn makes the wearer conqueror of all bad things and gives protection against all diseases of the eyes. It dispels pains of the liver, and cures stoppage of breath, and the wearer shall be victorious in battle. The Balas Ruby was believed to repress vain and lascivious thoughts, appease quarrels between friends, and give health of body. Its powder, taken in water, cured diseases of the eyes and pains in the liver. If the four corners of a house, orchard, or vineyard were touched with this gem, they were safe from lightning, storm, or blight. The Opal was proof against all diseases of the eyes and preserved and strengthened the sight. Magically, it had the power of drawing all other gems to itself, and bestowed upon the wearer the qualities granted by Nature for its own purpose, for it penetrated all souls and dazzled all eyes. At the present time it is believed to bring ill luck to the wearer. The Coral defended against the scorpion and asp and guarded mankind on toilsome journeys. Amber and jet were preservatives against all complaints of the throat. If placed on the left breast of one's wife, they would force her to confess all the naughty things she had done. The Topaz if thrown into boiling water cooled it immediately, hence the gem cooled lust, calmed madness, augmented wealth, averted sudden deaths, and found favor with the great. The Turquoise guarded the horseman and averted all accidents. The enumeration of various supersti-

tions might be continued, ad infinitum, but it is sufficient to mention some instances of eminent men who have placed on record their belief in magic, omens, dreams, etc., and the results to which a pursuit of these superstitions has led, some of them very important: The dæmon of Socrates was a preceptor, or monitor, who gave him counsel and assistance in all concerns and actions of his life. Plutarch, Apuleius, and Cicero, all composed separate treatises in reference to the genius or dæmon which Socrates claimed to be his guide. Alexander became terrified at the sight of blood appearing inside the soldiers' bread during the siege of Tyre in 332 B.C. The seer who was consulted in reference to the event, happily foresaw in the crimson flowing from the soldiers' food a happy issue for the Macedonian king. A proclamation was issued, the incident fully narrated, and, nerved by the happy augury, the soldiers went to victory, and Tyre was vanquished. Luther believed in witches, and claimed to have hurled his inkstand at the Devil, and to have hit him, at which his Satanic majesty hastily fled his presence. Louis XIII. of France made a Franciscan monk his grand almoner, because he was promised a hundred years' reign. Even Archbishop Laud, with all his learning, was not free from the superstitions of the age. He noted down his dreams and various casual circumstances, as omens, to such a degree that a prominent writer in a leading Review of the period designated him as a "ridiculous old bigot," "forgetting the vices of his heart in the abject imbecility of his intellect." In Addison's (q.v.) *Spectator*, this sentence is found: "When I consider whether there are such persons as witches, my mind is divided; I believe in general that there is such a thing as witchcraft, but can give no credit to any particular instance of it." Mohammed was a fatalist. In the 11th century there were several instances of the alarming spectacle of the "Bleeding Host," and bleeding and bloody bread, as well as bewitched bloody milk, gave simple folk a scare.

In 1264, and again in 1383, drops of blood were found on the holy sacrament while it reposed on the altar. In 1510-38 Jews were burned, because, at it was claimed, they had tortured the consecrated host until it bled. The proof was the appearance of the blood. The bloody sight was witnessed again in 1824 on the river Moselle; and it was not until the year 1848, that a learned chemist, Ehrenberg (q.v.), declared on the authority of his microscope, that the red stains found on the bread, cheese, potatoes, and even on the consecrated host, were merely due to countless insects, microscopically small. In the inhuman burning of the Jews already mentioned, there was no scientific Ehrenberg to show their superstitious butchers that what they called a proof of the consecrated wafer being tortured until it bled was merely due to an aggregation of microscopic insects of a deep red color. Napoleon Bonaparte believed implicitly in his "Star of Destiny." Some of the results of following superstitious beliefs are remarkable: Roger Bacon stumbled on the composition of gunpowder; Gebir discovered many properties of acids; Van Helmont was so wonderfully successful in his cures as to attract the attention of the Inquisition, the members of which attributed his work to the Devil, nevertheless his discoveries in science, as well as the discoveries of Dr. Glauber, of Amsterdam, whose name is associated with a medicinal compound of world-wide reputation, have greatly benefited the world. The alchemist was too frequently the victim of a false idea, a fetishism. He was a slave of superstition; he worshiped science, the conqueror of power, but he often stumbled upon remarkable results. While alchemy and all its belongings may have dealt largely in a hopeless imposture, there was yet an immense resultant good.

SUPERTONIC, in music, the note which, in the diatonic scale, is next above the tonic or keynote, and forms with it the interval of the second, as D in the key of C major.

SUPPÉ, FRANZ VON, composer, b. in Dalmatia, April 18, 1820. He was sent by his father to study philosophy at the University of Padua, and studied music, which he chose for a profession. In Vienna he became the pupil of Sechter and Seyfried, and remaining there was kapellmeister of several theatres. Von Suppé composed a large number of operas, the most popular of which are: *Poet and Peasant*; *Pique Dame*, 1864; *Futinitza*, Vienna, 1876; *Boccaccio*, 1879; *Donna Trianita*, 1880; and *Bellman*, 1887; also overtures, quartets, and songs. He died in 1895.

SUPPLE JACK, a name given in the southern parts of the United States of America to the *berchemia volubilis*, a twining shrub of the natural order *rhamnaceæ*, which is found as far n. as Virginia. It has oval leaves, small flowers, and violet-colored berries. It abounds in the Dismal Swamp and in similar situations, and ascends to the tops of the highest trees. The genus *berchemia* contains a number of species of twining shrubs, natives of warm climates in different parts of the world. The name Supple Jack is also given in the West Indies and tropical America to *serjania* (or *seriana*) *tritermata*, a shrub of the natural order *sapindaceæ*, with a long, flexile, woody stem, which climbs to the tops of the highest trees, and is used for walking-sticks. It has poisonous properties, and is employed for stupefying fish.

SUPPORTERS, in heraldry, figures placed on each side of an armorial shield, as it were to support it. They seem to have been, in their origin, a purely decorative invention of mediæval seal-engravers, often, however, bearing allusion to the arms or descent of the bearer; but in the course of time, their use came to be regulated by authority, and they were considered indicative that the bearer was the head of a family of eminence.

or distinction. The most usual supporters are animals, real or fabulous; but men in armor are also frequent, and savages (q.v.), or naked men, often represented with clubs, and wreathed about the head and middle. There are occasional but rare instances of inanimate supporters. On early seals, a single supporter is not unfrequent, and instances are particularly common of the escutcheon being placed on the breast of an eagle displayed. The common rule, however, has been to have a supporter on each side of the shield.

SUPPOSITORY. Solid medicated bodies intended to be introduced into the rectum, either for the purpose of causing evacuation of the bowels by irritating the mucous membrane of the rectum, or of producing a specific effect on the neighboring parts. Their form is various, the spherical being preferable when the bulk is small. They are of such a consistence as to retain their shape, and at the same time soft enough to prevent injury to the walls of the rectum. For laxative purposes the suppository may be from one to three inches in length and the size of a candle. Where it is desired to have it retained for some time in the rectum, a smaller size is used, and the irritative influence of distension avoided. Soap is often employed, and solidified molasses (molasses candy) is frequently used with most beneficial results. The drugs used in the manufacture of suppositories depends upon the requirements of the case. Carboic acid, tannic acid, aloes, asafœtida, belladonna, mercury, morphia, soap, opium, lead and opium, all enter into the composition, as the exigencies of the case demand.

SUPPRESSIO VERI. Lat., a suppression of the truth. See **SUGGESTIO FALSI**.

SUPPURATION is a morbid process which gives rise to the formation of pus (q.v.), which, as is well known, is one of the commonest products of inflammation. There are two doctrines as to the origin of pus. The opinion universally adopted till very recently was, that it was formed from an excessive exudation of the fluid portions of the blood through the walls of the capillaries; in which exudation, under certain conditions, pus-cells were developed. This view is now rejected for the doctrine of Virchow, the eminent professor of pathology at Berlin, who maintains that pus-cells are generated from the corpuscles of areolar tissue, which he supposes to permeate nearly every portion of the body. Pus, according to Virchow, is a young tissue in which, amid the rapid development of cells, all solid intercellular substance is gradually dissolved. A single cell of areola or connective tissue may, in an extremely short space of time, produce some dozen of puss-cells; but the result is of no service to the body, suppuration being, to use his own words, "a pure process of luxuriation, by means of which superfluous parts are produced, which do not acquire that degree of consolidation or permanent connection with one another, and with the neighboring parts, which is necessary for the existence of the body." There are two different modes of pus-formation, according as the pus proceeds from epithelium (q.v.) or from connective tissue (see **CELLULAR TISSUE**). When puss is formed from epithelium, it is produced without any considerable loss of substance, and without ulceration; but when it is formed from connective tissue, ulceration must always exist. The mucous membranes vary in their power of forming pus. A mucous membrane, according to Virchow, is the more qualified to produce pus without ulceration the more completely its epithelium is stratified, those with a single layer of epithelium being less adapted for the production of pus. Thus the intestinal mucous membrane scarcely ever produces pus without ulceration; while other mucous membranes, containing several strata of cells, are capable of secreting enormous quantities of this fluid without the slightest ulceration (as, for example, the arethral mucous membrane in gonorrhea).

The above cases of suppuration occur on free or exposed surfaces, and are unaccompanied with loss of tissue. Deep-seated pus-formation takes place only in connective tissue. The first stage of formation consists in an enlargement of the normal cells, and a division and excessive and rapid multiplication of their nuclei. This is soon followed by division of the cells themselves, and their conversion into true pus-cells. If this process takes place beneath a surface which does not participate in the morbid change, or which is capable of resisting it for a time, an *abscess* is formed; whereas, when pus-cells are poured forth from an exposed surface, we have an *ulcer*.

Although suppuration is a morbid process, it often accompanies processes of a beneficial tendency (such as granulation), and frequently takes the place of other far more morbid processes. It further affords a mechanical means of removing foreign bodies, such as thorns, splinters of glass, etc., from soft parts into which they may have been driven; and it is possible (as some pathologists believe) that the formation of abscesses may sometimes serve to eliminate morbid matters from the system.

SUPRALAPSARIAN (Lat. *supra*, before, *lapsus*, the fall), the name given to the school of divines which maintains that God's absolute decree of election and reprobation is antecedent to his foresight of the fall of Adam, and irrespective of it. See **SUBLAPSARIAN**.

SUPRA-RE'NAL CAPSULES AND THEIR DISEASES. The supra-renal capsules are two small, flattened, glandular bodies of a yellowish color, situated, as their name implies, immediately in front of the upper end of each kidney. In weight they vary from one to two drams. They belong to the class of ductless glands, and on making a perpendicular section, each gland is seen (like the kidney) to consist of cortical and medullary substance. The blood-vessels and nerves of the glands are exceedingly numerous. Of late

years much attention has been drawn to the diseases of these organs from the observation of the late Dr. Addison (of Guy's hospital), that such cases are frequently associated with the deposition of pigment in the skin, causing it to assume a deep bronze color. The following definition of *Addison's disease*, or *supra-renal melasma*, or *bronzed skin disease*, embracing all the most important points in its natural history, is given by Dr. Aitken: "A morbid state which establishes itself with extreme insidiousness, whose characteristic features are anæmia, general languor and debility, and extreme prostration, expressed by loss of muscular power, weakness of pulse, remarkable feebleness of the heart's action, breathlessness upon slight exertion, dimness of sight, functional weakness and irritability of the stomach, and a peculiar uniform discoloration of the skin, which becomes of a brownish olive-green hue, like that of a mulatto, occurring in connection with a certain diseased condition of the supra-renal capsules. The progress of the disease is very slow, extending on an average over one year and a half, but may be prolonged over four or five. The tendency to death is by asthenia, the heart becoming utterly powerless, as if its natural stimulus—the blood—had ceased to act."

SUPREMACY, ROYAL. The term supremacy is, in politics, chiefly used with regard to authority in matters ecclesiastical. From the time of Pope Gelasius (494 A.D.) to the reformation, the pope exercised a very extensive authority, judicial, legislative, and executive, over all the churches of western Europe, somewhat undefined in its limits, varying in different countries and at different periods; which continues to be more or less recognized in all countries whose inhabitants are in communion with the church of Rome. At the English reformation, the papal supremacy was abolished, and act 26 Henry VIII. c. 1, declared the king and his successors to be the "only supreme head on earth of the church of England." A curious document was at the same time drawn up by the government, in which, to avoid misconception, it was explained that the recognition of this headship of the church implies only that the king should have such power as of right appertaineth to a king by the law of God, and that he should not take any spiritual power from spiritual ministers, or pretend to "take any power from the successors of the apostles that was given them by God." In 1535, the same year in which this act was passed, John Fisher, Bishop of Rochester, sir Thomas More, and others were beheaded for denying the king's supremacy; and in 1578, John Nelson, a priest, and Sherwood, a young layman, suffered the punishment of death for the same offense. The assumption by Henry VIII. of the title of "head of the church," notwithstanding the explanation alluded to, was much commented on; and on the accession of Elizabeth, it was thought prudent, while again claiming the supremacy in all causes, as well ecclesiastical as civil, to keep that designation in the background. By successive statutes, the oath of supremacy was appointed to be taken by the holders of public offices along with the oath of allegiance and of abjuration, and these three oaths were consolidated into one by 21 and 22 Vict. c. 48. The subject of oaths was, however, revised by the legislature in 1868 and 1871; and a new short oath of allegiance, in which the royal supremacy in matters ecclesiastical is not in express words specified, was substituted for the oath previously imposed upon members of both houses of parliament. See OATH.

SUPREME COURT. See JUDICIARY IN THE UNITED STATES.

SURABAYA, a leading sea-port of Java, and capital of a residency, is situated on the Kali Mās mouth of the river Kediri, near the strait of Madura, and on the Surakarta-Probolingan railway, in 7° 14' s. lat., and 112° 44' e. long. The population of the city and suburbs is about 110,000. The European town is on the w. bank, 5 bridges connecting it with the Chinese and Javan quarters on the east. It has a fine harbor guarded by two forts, a naval arsenal, a mint, numerous foundries, sugar refineries, and manufacturing of machinery, furniture, &c. Pop. '94, 148,199, including about 7000 Europeans. The residency of Surabaya comprises an extensive tract of fertile land in the n.e. of Java and the island of Madura. Rice, coffee, sugar, indigo, cotton, tobacco, and cocoanuts are extensively cultivated. Pop. of residency, '91, 2,005,005.

SURAFEND, a town in Palestine, 10 miles s.w. of Sidon, claimed to be the place where Elijah raised the widow's son from the dead. It was in ancient days celebrated for its wine.

SURAKARTA, a residency of Java, s.e. from Samarang, with an area of 2188 sq. m.; population in 1891, 1,163,305, of whom 2658 were Europeans and 8111 were Chinese. The country for the most part is mountainous, but nowhere do the mountains rise to a great height, the highest peaks being the Lawu on the east coast and Merbabu and Merapi on the west coast. The chief river of the residency is the Solo. The land is well watered and fertile, producing rice, maize, sugar, coffee, tea, indigo, tobacco, cacao, pepper, vanilla, and tropical fruits. Nominally the government is in the hands of a native chief known as the emperor of Surakarta, but he has surrendered his rights to the Dutch in return for important concessions. The Dutch maintain a resident at the capital.

Surakarta, the capital of the empire, and seat of the residency, lies on the left bank of the Solo, in 7° 31' 30" s. lat. and 110° 46' 7" e. long., covers a large space, and had in 1894 a population of 101,987, including about 1200 Europeans and 4090 Chinese. Many princes and nobles have their palaces in Surakarta; that of the emperor is of great extent and splendor. North-east from the royal parks lies the European town, in front of which, surrounded by the parade ground, and commanding the palace, is a square fort, with

broad canal and drawbridges at the four corners, and mounted with heavy artillery. It has railway connections with Surabaya, Samarang, and Batavia.

SURAT (Sans. *Saurashtra*, good country), a large but declining city of British India, capital of a district of the same name, 150 m. n. of Bombay, on the Ahmedabad-Bombay railway, and about 17 m. from the mouth of the Tapti, in the gulf of Cambay. It is 6 m. in circumference, and it is surrounded on the landward side by a brick wall. It has numerous mosques, several Hindu and Parsee temples, an Anglican, Portuguese-Catholic, and Armenian church. The palace of the pensioned Nabob of Surat, a high school, two hospitals, and, in 1891, a population of 109,229, inclusive of a large garrison. Its harbor, Suwalli, at the mouth of the Tapti, owing to a sand-bar, affords entry only to small vessels, and accordingly the commerce of Surat, which was once an important commercial center, has been steadily diverted to Bombay. It still exports a considerable quantity of silk and cotton fabrics. Surat is said to have contained — but this is probably an exaggeration — 800,000 inhabitants at the close of the 18th c., about which time its markets were crowded with the costliest wares, brought by merchants from the remotest countries. Surat is a place of considerable military strength, and the residence of a British military commandant and other dignitaries.

Surat was long thought to be one of the most ancient cities of Hindustan, but this opinion is now abandoned, and it is believed to have been a mere fishing-village as late as the 13th century. It first rose into importance as the spot whence the Mohammedans of Hindustan embarked on their religious voyage to Mecca. Surat was sacked in 1512 by the Portuguese soon after their arrival in India. In 1612 an English force arrived here in two vessels, under the command of Capt. Best, who defeated the Portuguese, and obtained a *firmān* from the Mogul emperor, authorizing the residence of a British minister. The Dutch trade with Surat commenced in 1617, when a Dutch factory was established. A French factory was founded in 1668. In the course of time, the English influence began to predominate. In 1759 the castle and fleet were made over to them; and from the year 1800 the government of the settlement has been entirely vested in their hands.

SURBASE. See PEDESTAL.

SURD. See IRRATIONAL NUMBERS.

SURETY. See GUARANTY.

SURFACE GRUB, the caterpillar of the *great yellow underwing moth* (*triphaena promuba*), a pretty large moth, with the upper wings deep brown or pale tawny, the under wings bright orange with a black border. This moth abounds in hay-fields in Britain at the season of haymaking. The caterpillar, when full grown, is nearly an inch and a half long, pale green with a tinge of brown, dotted with black, three pale lines down the back, and seven black spots on the inside of each of the two outer ones. It often does great mischief to the roots of cabbages and turnips, and also devours the roots of grass.

SURF DUCK, or **SURF SCOTER**, *Oidemia perspicillata*, a species of scoter extremely plentiful on the coasts of Labrador, Hudson's bay, and other very northern parts of America, from which great numbers migrate southward in winter. It is a rare visitant of the coasts of Britain and other parts of Europe. In size it is about equal to the mallard. The plumage is black, except two patches of white on the head and back of the neck. It is never seen on lakes or rivers, but only on the sea-coast. It dives so quickly that it is very difficult to shoot except when on the wing. Its flesh is rank, and has a fishy taste.

SURGEON, ARMY AND NAVY. An appointment to the medical corps of the army or navy is made only after a satisfactory examination, conducted by at least three medical officers, appointed for the purpose by the sec. of war. The candidate must be a graduate of a medical college, and be between the ages of 21 and 28 years for the army, and 21 and 26 for the navy. A surgeon in the army has the rank of major, and is required to have been an assistant surgeon at least five years. A surgeon in the navy has the rank of lieutenant, and must have been an assistant surgeon for two years. The assistant surgeons of the army and navy have respectively the rank of lieutenant and ensign.

SURGEONS, COLLEGE OF. The present "Royal College of Surgeons of England" dates its origin from the year 1460-61, when Edward IV. "did, at the supplication of the freemen of the mystery of barbers of the city of London using the mystery or faculty of surgery, grant to them that the said mystery, and all the men of the same mystery of the said city, should be one body and perpetual community." In 1500, four masters in surgery were appointed, under the title of "Magistri sive Gubernatores mistere Barbitonsorum et Sirurgicorum" (*sic*), and six years after this date the barber-surgeons of Edinburgh were incorporated by a charter from James IV. Although the original charter granted to the company of barbers of London was confirmed by several succeeding kings, many persons practiced surgery independently, and apparently in defiance of the company; and in order to check unqualified persons, it was enacted in the 3d year of Henry VIII. (1511) "that no person within the city of London, or within seven miles of the same, shall take upon him to exercise or occupy as a physician or surgeon except he be first examined, approved, and admitted by the bishop of London, or by the dean of St. Paul's, calling to him four doctors of physic, and for surgery other expert persons in that faculty." Hence arose a company called the surgeons of London. In

the 32d year of Henry VIII. (1540), the company of barbers of London and the company of surgeons of London were united "by the name of the masters or governors of the mystery and commonalty of the barbers and surgeons of London." It was not till the 18th year of George II. (1745) that the surgeons of London were by act of parliament separated from the barbers of London, and made a distinct corporation under the name of "The Master, Governors, and Commonalty of the Art and Science of Surgery of London." In the 40th year of George III. (1800), this company was dissolved, and replaced with their former and additional privileges by "The Royal College of Surgeons of London." A new charter was granted to the college in the 7th year of Victoria (1843), in which it is declared "that it is expedient to create a new class of members, to be called fellows," and "that from henceforth the corporate name or style of the said college shall be THE ROYAL COLLEGE OF SURGEONS OF ENGLAND." Power was given to the council to elect not less than 250, nor more than 300, members of the college to be fellows. These "first fellows" were mainly elected from the London and provincial hospital surgeons. Other fellows might subsequently be elected from the members, "after having complied with such rules and regulations as shall be considered expedient, and after having passed a special examination." Those who are admitted to the fellowship by examination are distinguished in the college calendar by the letters *Ex* being prefixed to their name. By an addition to the charter, obtained in 1852, power was given to the council, subject to certain regulations, to appoint members of 15 years' standing to the fellowship without examination. The college was likewise empowered to test the fitness of persons to practice midwifery and to grant certificates of such fitness; and in 1859 it was similarly authorized to test the fitness of persons to practice as dentists, and to grant certificates of such fitness.

The government of the college is vested in a council of twenty-four persons, including one president and two vice-presidents; and none but fellows of 14 years' standing are eligible as members of council. Three members of council go out annually by rotation, and the vacancies are filled up on the first Thursday of July. There is a board and a court of examiners, each consisting of ten members, including a chairman at the former, and a president at the latter; and as the examiners, who receive large emoluments (the fees to the court of examiners for the professional examination of members for the year ending June 24, 1878, were £10,110 15s.), are elected by the council, whose remuneration is slight, a position in the council is eagerly sought for as a stepping-stone to an examinership. Besides the court of examiners, there are special boards of examiners in midwifery, in dental surgery, and in classics, mathematics, and French for the preliminary membership and fellowship examination. There are four professorships in connection with the college—viz., that of human anatomy and surgery, the Hunterian professorship of comparative anatomy and physiology, the chair of surgery and pathology, and that of dermatology. A Hunterian orator is appointed every second year. The college sends a representative to the general council of education and registration. A candidate for the membership of the college is required to pass a preliminary examination in the usual branches of a liberal education. The fee for the anatomical examination is £5 5s., and that for the surgical, or pass-examination, is £16 15s., making a total of £22. The fellowship fee is an additional 10 guineas. For details, see the *Calendar of the Royal College of Surgeons of England*.

The museum of the college of surgeons is incomparably the finest museum of its kind in the United Kingdom. The Hunterian collection (see HUNTER, JOHN), which forms its basis, was purchased by a parliamentary vote of £15,000, and presented to the college in 1799. The edifice in Lincoln's Inn Fields (the germ of the present pile of buildings) was completed in 1813. The Hunterian collection was estimated to consist of 13,682 specimens; the total number of specimens was recently reckoned at above 40,000. The library contains 36,000 volumes. Both the museum and library are readily accessible to visitors.

SURGEONS OF EDINBURGH. ROYAL COLLEGE OF, was originally an association of those professing "surregerie and barbour-craft," who obtained their first civic charter in 1504, and had it confirmed by James IV. next year. About 1589 began the custom of granting leave to barbers to practice their profession, without admitting them to the full freedom of the incorporation. For a century and a half the members of the craft were sole teachers and almost sole professors of the surgical art in Edinburgh, and contrived to hold their own against the physicians, who, both before and after their incorporation as a royal college in 1681, made efforts to secure authority over the surgeons. In 1637 the surgeons granted the apothecaries a civil status in alliance with themselves; the nominal connection with the barbers was dissolved in 1732. A patent of 1694 settled the relations between the surgeons and the physicians, making amicable terms possible; and in 1778 the surgeons became formally a royal college too. Nevertheless they remained, much against their will, one of the incorporations of Edinburgh, till the act of 1851 dissolved what survived of their civic rights, and set the college free from the galling control of the town council. The college, which in 1881 had more than 450 fellows, sanctions the lectures of a staff of its own members as qualifying for examination candidates for its diploma of licentiate, and appoints a board of examiners. This examination is now usually taken in connection with that for the diploma of the college of physicians.

SURGERY. The art of surgery came into existence ages before those who practised it gave it a name. When finally the Greek words *cheir*, "the hand," *ergon*, "work," signifying the manual interference by means of instruments or otherwise, in cases of bodily injury, were combined to form the word *chirurgion* or surgeon, the art was already old, and the wisest of the Egyptians were familiar with operations which we consider important to-day. But surgery has no proper history previous to the advent of the great master and teacher, Hippocrates, whose name will occupy a position of honor forever in the annals of medicine. The sacred Scriptures furnish records of operations, but these referred more particularly to religious rites; such, for instance, as the operation of circumcision performed on Abraham when he was ninety years of age, about 1897 years before the Christian era. This operation was usually performed with sharp Ethiopian stones. "Then Zipporah took a sharp stone and cut off the foreskin of her son and cast it at Moses' feet." This method of operation was used by the Ethiopians as late as the sixteenth century. The idea that the ancient Egyptians, learned in every department of life, and yet deriving no information from frequent operations of evisceration in embalming, is untenable. The remains of mummies prove very conclusively that the science of bandaging, not the least important in the art of surgery, was well understood by them. The healing art among the ancient Egyptians had advanced to a very high degree in the time of Herodotus. Twelve hundred and fifty years before the Christian era, Æsculapius was worshipped as the divine physician. The offices of priest and physician were at this time combined. Even in the early history of the Christian era this state of affairs existed, until finally by papal decree regular schools of medicine were inaugurated, and medical art began its enlightened career. In the fifth century before Christ, Hippocrates elevated the practice of medicine to such an extent that surgical history is dated from his epoch. He was the contemporary of Socrates. Aside from his remarkable genius as physician and surgeon, the noble character of Hippocrates shines as an everlasting monument of professional worth. It was he who said of medicine, "It is of all the arts the most noble; but owing to the ignorance of those who practice it, and of those who, inconsiderately, form a judgment of them, it is at present far below all the other arts. Their mistakes appear to me to arise from this, that in the cities there is no punishment connected with the practice of medicine except disgrace, and that does not hurt those who are familiar with it. Such persons are like the figures which are introduced in tragedies, for as they have the shape and dress and personal appearance of an actor, but are not actors, so also are physicians many in title but few in reality." Half of the remarkable works which he has given to medical science are devoted to surgery.

Fractures and dislocations were as carefully adjusted and reduced as at the present time; abscesses of the liver and kidney were operated on without reserve, and those operations which we consider capital were very commonly performed; nor was the brilliancy of his fame acquired by mere accident. We have undoubted proof that his knowledge of surgical anatomy was acquired only after faithful and painstaking dissection. His surgical skill included the knowledge of complete resections of bones at the joints, but amputations were rarely practised. It is interesting to note that the use of suppositories was not unknown to him.

In the third century before the Christian era, Alexandria became the great school of anatomy, surgery, and medicine. Herophilus and Erasistratus were as distinguished for their surgical skill as for their anatomical knowledge. Science was cultivated to the highest degree, and the dissection of the human body, which had been hitherto prohibited, was now permitted. Very many of the anatomical names now in use originated in the investigations of Herophilus. The name of Erasistratus has been handed down as that of a bold and skilful surgeon. One member of this school, Ammianus, invented an instrument by which he broke down stones in the bladder, thus anticipating by two thousand years Civiale's discovery of lithotritry. When the great Alexandrian library was destroyed by fire, much that was valuable in surgical literature perished in the conflagration.

Rome then became the headquarters of science in all its departments. The medical and surgical art languished under the edicts which were publicly directed for their destruction. The early Romans of all ranks held surgeons and physicians in abhorrence, and trusted for cures, even in cases of dislocation and fracture, to spells and incantations. The first regular surgeon who settled in Rome was Archagathus, two hundred and twenty years B.C. He was a student of the Alexandrian school, thus transplanting the germ of surgical knowledge in the west. At first his skill procured for him a high reputation and the title of "Healer of Wounds," but the old prejudices soon revived, and he was banished from the capital with the title of "Executioner."

About the year 96 B.C. Asclepiades, a native of Bithynia, settled in Rome and acquired great renown as a physician and surgeon. His writings, though no longer in existence, have been quoted by Celsus, Scribonius, Largus, Cælius Aurelianus, Galen, Oribasius, Aëtius, Pliny, and others. He is supposed to be the originator of laryngotomy, and evidently made a specialty of diseases of the throat. It was owing to his great influence and skill that the prejudice against medical men came to an end in Rome. He was the personal friend of Cicero, who refers to him when he says, "Nothing brings men nearer to the gods than the giving of health to their fellow-creatures." Cassius, a student of Asclepiades, was a distinguished anatomist and surgeon. At the

beginning of the Christian era the art of surgery had advanced to an honorable position in the Roman capital. Celsus, a distinguished and learned doctor, stood easily at the head of the profession. He improved the mode of performing lithotomy and amputation, described the operation for cataract, and is said to have been the first to recommend the application of ligatures to wounded arteries, for the purpose of arresting hemorrhage. His works possess such remarkable value that they have "always been admired by classical scholars for the purity and beauty of their Latinity, and highly valued by our own profession as one of the most precious monuments of antique surgery now extant." In examining his writings, we are struck by the minute attention to details, and the earnest practical instruction contained in them. That his works can survive through all these centuries and remain storehouses of professional instruction, is enough to illustrate the grandeur of his knowledge. Soranus was the first gynecologist of whom we have any special knowledge; he made use of the vaginal speculum and of the uterine sound, and published a valuable treatise, *De utero et pudendo muliebri*. This work gives evidence of great improvement and knowledge in obstetrics and gynecology. Aretæus, of Cappadocia, who practiced in Rome during the latter half of the first century, was the first to employ blisters, using cantharides as we still do for that purpose. Rufus, of Ephesus, a distinguished anatomist and surgeon, lived during the reign of Tiberius. He is supposed to have been the first to tie an artery which had become aneurismal in consequence of being wounded in venesection. His treatise, *De appellationibus partium corporis humani*, is still extant. Rufus also called attention to the recurrent nerve. Galen, who practiced in Rome in the latter part of the second century, mainly obtained his great reputation by his medical practice. He rendered distinguished services in surgery in his treatment of fractures and dislocations and of hemorrhage by ligation. He was skilled in the art of bandaging, and was an excellent diagnostician. Oribasius, a native of Pergamos, a pupil of Zeno, flourished in the fourth century. He was a conservative surgeon, but a man of great learning and practical common sense. Aëtius, in the sixth century, recommended scarification of the legs in dropsy, tried to dissolve urinary calculi by internal remedies, studied the diseases of the eye, and is the first writer who notices the guinea-worm. He wrote on aneurisms, hernia, and other surgical subjects, but more especially on gynecology. His articles on the use of the vaginal speculum, the uterine sound, sponge tents for the dilatation of the os uteri, the surgical treatment of cancer of the breast, on the causes of difficult labor, and on the use of pessaries, suppositories, injections, are scholarly and practical. Paulus Ægineta, in the seventh century, was the last of the Greek medical and surgical writers. He was distinguished as an obstetrician, he opened internal abscesses by caustics, improved the operation of lithotomy, described several varieties of aneurism, extirpated the breast, performed laryngotomy and tracheotomy, and was the originator of the operation of embryotomy. His sixth book is regarded as the best treatise on surgery previous to the revival of letters. He contributed medical literature on the various forms of intestinal hernia. His directions for operating in strangulated hernia are considered unrivalled at the time at which he wrote. When the destruction of the Alexandrian Library took place, some of the works which were saved were translated into the Syriac and Arabic languages, by which mediums it was dispersed throughout Western Asia, and so it came to pass that the seat of learning was transferred for a time from beneath the shadow of the cross to the empire of the crescent, and from the classic shores of Italy and Greece to the warlike followers of Mahomet and the fiery descendants of Ishmael."

The surgery of the Arabians is the surgery of the Greeks. In the seventh century the Caliph Al-Mansoor founded a college in Bagdad, which became a famous centre of intellectual culture. Bagdad contained thousands of students in the several departments of arts and sciences, and besides its schools and colleges possessed public hospitals and laboratories.

"Whether in the East or in the West, surgery may boast of having had an origin that well deserves to be called noble, for the earliest practice arose from the most generous sentiment which nature has implanted in the heart of man—namely, from that sympathetic benevolence which leads us to pity the misfortunes and sufferings of others, and inspires us with an anxious desire to alleviate them. He who first saw his fellow-creature suffer could not fail to participate in the pain and endeavor to find out the means of affording relief." Thus in every land, whether among Greeks or Romans, or among the followers of the cross or the crescent, the art of surgery became an absolute necessity, and the most brilliant and enlightened minds labored industriously for its improvement. In the early part of the tenth century there was born in Persia a celebrated Arabic writer, Rhazes by name. He had charge of an immense hospital at Bagdad, had been a traveller in foreign lands, and was well read in the medical literature of his time. His writings clearly prove him to have been a surgeon of high rank. He was the first to describe spina bifida. Avicenna, called the prince of physicians, was one of the most distinguished of the Arabic writers. The works of Hippocrates, Galen, and Avicenna are supposed to "have exercised a greater and more continued influence over the minds of medical men than any or all the authorities the world has ever produced." Haly Abbas was also born in Persia, and dwelt most of his time in Bagdad. His large hospital experience taught him the value of clinical instruction for medical students. His works on surgery were of very advanced and practical stand

ing, and exercised a long and powerful influence in mediæval times. Albucasis, who died in 1122, described an instrument for the cure of fistula lacrymalis, the removal of tumors by ligature when the knife is inexpedient, the suture of wounded intestines, which marks a tremendous advance in the era of surgery, the use of the probang in obstruction of the gullet, etc.; and is the only writer on surgery of ancient times who describes the instruments used in each operation. These he illustrated with figures or drawings; ninety-seven operations requiring the knife are thus described. He may be said to have made a specialty of the use of the cautery, actual and potential. This was a favorite practice with all the Arabian surgeons. Long before his time, Dioscorides, the contemporary of Celsus, spoke of the use of the actual cautery as the Arabian burnings. Not less than five-and-twenty editions of his works have been printed, from the earliest at Venice, in 1471, to the latest at Oxford, in 1778. About the year 1070 there was born in the city of Seville the celebrated Saracenic surgeon, Abenzohar. He performed the operation of bronchotomy, and, on account of his boldness in surgical procedure, was known as the "Experimenter." He was the first to describe methods of artificial alimentation, the first anticipating the œsophageal tube, the second the use of nutritive baths, and the third mode that of rectal alimentation. Oribasius also wrote concerning clysters. Averroës, the student of Abenzohar, regarded his "admirable master" with the greatest reverence, calling him "the Glorious," "the treasury of all medical knowledge," "the supreme of physicians from the days of Galen to his own times." The father and grandfather of Abenzohar were eminent physicians, and thus it would appear that he almost inherited his profession. His natural medical training thus probably accounts for his thorough and painstaking researches as an anatomist. We have not time to refer to the medical history of Sahrnum, or to make any reference to the *Susruta*, the ancient surgical treatise of the Hindoos.

During the dark ages medicine and surgery were usurped by the priesthood, who drove a thriving and lucrative business by combining the medical and ecclesiastical professions. Their ignorance was only equalled by their cupidity and venality. The healing art was degraded to the last degree. Pettigrew gives the names of nearly fifty Roman Catholic saints who were believed to have special control over certain individual diseases, both medical and surgical. Each well and spring had its protecting saint; and charms, relics, and amulets as preventives and cures of disease prostituted the healing art to priestcraft and quackery.

The episcopal college of Paris had medical professors who gave advice and treated surgical cases in the interiors of the churches. Pope Alexander III. denounced these priest-physicians, and finally medicine was effectually divorced from theology by a special bull which permitted physicians to marry. After the emancipation of the healing art from the hands of the clergy, Pitard, an eminent surgeon in Paris, founded in 1271 the College of Surgeons.

During the thirteenth century many of the schools of Bologna, Padua, Naples, Paris, Montpellier, Toulouse, Valencia, Tortosa, and Oxford were founded. To the labors of Gerard de Cremona, of Lombardy, we owe much of the incentive to medical study. He translated from the Arabic works and transmitted to the Latins the medical knowledge of the East. In the fourteenth century, surgery, which had been well-nigh extinct in England, received new life in the labors of Gilbertus Anglicus, John of Gaddesden, and John Arderne. In the middle of that century Guy de Chauliac was the first to describe the Cæsarian operation practiced at Avignon. During the fifteenth century the local application of arsenic for cancer was proposed by Taranta, a Portuguese surgeon practicing at Montpellier.

Colot, a distinguished surgeon high in favor with Louis XV., in the year 1461 undertook a series of experiments upon the dead body, in order to investigate the operation of lithotomy. Permission was granted him by the king to operate on a convict who had been condemned to death. "The death sentence having been commuted to lithotomy, Colot performed the operation successfully in the churchyard of Saint Severius, in the presence of the king, cured his patient, received a liberal pension, advanced the art of surgery, and rendered his own name immortal." The names of Pierre Franco, François Russet, James and John Douglass, William Cheselden, J. J. Rau, and Frère Jacques are all associated with the history of lithotomy. The surgery of the sixteenth century may be said to be represented by Ambrose Paré. This was a brilliant period in the history of anatomy and surgery.

Among the eminent anatomists were Andreas Vesalius, Columbus, Fallopius, Fabricius, Acquapendente, and others. To Paré is given the credit of introducing the ligature into surgery. "I think it was taught me by the special favor of the sacred deity," says Paré; "for I learnt it not by my masters, nor of any other, neither have I at any time found it used by any, only I have read it in Galen that there was no speedier remedy for staunching of blood than to bind the vessels through which it flowed toward their roots—to wit, the liver and the heart." The ancient surgeons had spoken of the ligation of blood vessels, but Paré certainly brought it into practical use. Thomas Gale, a military surgeon in England, was a contemporary of Paré, and received his education from Richard Ferris, sergeant-surgeon to Queen Elizabeth. Early in the seventeenth century, 1612, a Scotchman named Lowe published a discourse on the whole art of chirurgery; and about fifty years later Wiseman, who has been appropriately termed the Paré of England, and the true father of British surgery,

flourished. He was sergeant-surgeon to Charles II., and his surgical works published in 1676 may still be read with interest. He was the first to dispel the dangerous belief that gunshot wounds were of a poisonous nature, and had consequently to be treated with the most painful kinds of dressing. Ancient surgical works abound with instructions concerning the poisonous nature of gunshot wounds.

Dionis, the French surgeon, thus refers to the invention of gunpowder: "Some ages since there came out of Hell a Monster in the Habit of a Monk, who, trying chymical experiments, invented a Composition of salt-petre and sulphur which we call Gunpowder. This diabolical invention," etc. It was difficult to overcome the erroneous idea that these wounds were necessarily poisonous. In spite of the great learning of many of the surgeons of this epoch, prayers, incantations, and charms, with or without boiling hot oils, the actual cautery, and the vilest of irritating ointments, were the usual remedies employed. Purmann, an army surgeon, thus describes the formula for weapon salve: "Earthworms, human mummy, swine's brain, magnet, and the moss of a man's skull that was either killed or hanged, and gathered when the star Venus is predominant." This ointment he had always with him in the camp, and often used it with great success. The peculiar method of using the ointment is, that the weapon wherewith the patient was wounded is anointed and not the wound itself.

Lawrence Heister, also an army surgeon, obtained great eminence in his treatment of gunshot wounds. James Young, an English surgeon, was the first to perform the flap operation in amputation. Schulteheis, a German surgeon of distinction, flourished about this time. Rau, of Leyden, one of the most successful lithotomists of any age, was the pupil of Frère Jacques.

Roonhuysen was the first to divide the sterno-mastoid muscle for wry neck, and may thus be regarded as the inventor of tenotomy. In 1728 was born John Hunter, the most distinguished anatomist and pathologist of the eighteenth century. His treatise on the blood, inflammation, and gunshot wounds is one of the most remarkable books published in the English language. The Peninsular War afforded him a vast field for valuable experience. He founded the famous Hunterian Museum of 14,000 specimens, and at a cost of £70,000 sterling. His remains rest in Westminster Abbey. The first surgical journal of which we have any record was that published by Desault, who was born in 1744. He invented the straight amputating knife. While attending Louis XVII. he died suddenly, and, as has been supposed, by poisoning. His successors, Chopart and likewise Doublet, who also attended the Dauphin, both followed him to the grave within four days. Monro, Benjamin Bell, and John Bell were celebrated surgeons of this century. Petit was celebrated for his work on diseases of the bones, and Desault was distinguished for his improvements in surgical instruments.

Richter and the illustrious Haller were distinguished surgeons of Germany.

Lancisi, Morgagni, and Scarpa were men of great renown in Italy, and had an international reputation as distinguished surgeons.

The London medical schools can point with pride to the names of Abernethy, Blizard, Brodie, Astley Cooper, Dalrymple, Earle, Guthrie and Hennen, Aston Key, Liston, Stanley, Travers, Tyrrell, Ware, James Wilson, and many other nearly equally celebrated surgeons of an earlier date. More recently we have the names of Arnott, Bowman, Erichsen, Fergusson, Prescott Hewitt, Hilton, Lane, Lawrence, Luke, Paget, Spencer Wells, and a host of others. In Edinburgh were Sir Charles Bell, Lizars, Miller, Syme (whose name will ever be associated with a special amputation of the foot and with the operation for stricture), and Sir James Simpson, the distinguished gynaecologist and the discoverer of the application of chloroform in surgical practice. Among the most recent advances may be mentioned the practice of antiseptic surgery, with which the name of Sir Joseph Lister (q. v.) is so worthily associated. The results following the Listerian practice have revolutionized surgery; recoveries from many serious operations have taken place in remarkably short periods, and with an absence of suppuration, and other secondary effects of the inflammatory process. See ANTISEPTICS.

Among the surgical celebrities of Dublin must be mentioned Peile, the inventor of the lithotome and staff; Todd, the father of the late eminent Dr. Todd, of London, who was the first to successfully revise the treatment of aneurism by compression; Colles, the first to describe the fracture known as Colles' fracture of the radius; Carmichael, distinguished for his opposition to the indiscriminate use of mercury; Bellingham and Hutton, Cusack, Porter, McDowel, and Sir Philip Crampton; Adams, well known for his treatise on the diseases of the joints and chronic rheumatism; R. W. Smith, celebrated for his researches on fractures and neuroma; and Jacob, the discoverer of the *membrana Jacobi*. It would be impossible to mention a tithe of the names of those who have attained high surgical celebrity during the present century.

The Barons Dupuytren and Larry, Amussat, Chassaignac, Civiale, Brasdor, Broca, Desmarre, Nelaton, Verneuil, Richet, Labbé, and Belpéau have honorably sustained the reputation of French surgery. Beer, the oculist; Chelius, Dieffenbach, Von Grafe, Gurlt, and Jäger, the oculist; Langenbeck, Stromeyer, Wützer, Billoth, Braun, Dümreicher, Nüsbaum, Bergmann-Bruns, and Tiersch constitute but a small portion of the eminent surgeons of Germany. Callisen, of Copenhagen, Porta, of Pavia, and Perogoff, of St. Petersburg, may be taken as the surgical representatives of their respective countries. In gynaecology the names of Späth, Scanzoin, De Paul, Hecker, Heger, Gaillard, Martin, Winckel, Rokitsky, Priestley, Lawson Tait, Johnson, Thornton,

Orthmann, Mugebauer, Folkmann, Kaltenbach, and last but not least, Schroeder, Barnes, and Leischman, distinguished obstetricians.

In our own country the history of surgery would readily fill a volume by itself. The annals of American medical science are simply unsurpassed. From the humble beginnings before the Revolutionary War, American medical science has advanced to the very highest position of professional worth and dignity. From Benjamin Rush down through the century of honor in medical progress the names of Americans are recognized throughout the world. Mott, Van Buren, Parker, Post, Nathan Smith, Sands, Warren, Bigelow, Gross, Pancoast, Morton, Agnew, Hamilton, Wood, Sayer, Janeway, Richardson, and Weir are among the most distinguished of our American surgeons. While in the field of gynecology the brilliant achievements of Sims, Thomas, Emmet, Peaslee, Skene, Crosby, Storer, Jackson, Parvin, and Cushing are recognized wherever medical science is known. For works of reference on surgical subjects we have in recent times the admirable treatises of Holmes, Hamilton, Smith, Ashurst, Gross, Bryant, and many others.

SURICATE, the *Ryzana capensis*, a carnivorous animal of s. Africa and the cape of Good Hope, sometimes called *zenick*. It belongs to the family *viverridæ* (q.v.), and is, therefore, allied to the civet (q.v.), genet (q.v.), ichneumon (q.v.), and paradoxurus. The generic characteristics are: feet rather long, and toes with robust claws adapted to burrowing habits; tongue furnished with horny *papillæ*; ears small; tail long, slender, and pointed. The *R. capensis* is about four feet long, including the tail; fur, a mixture of brown, white, yellowish, and black. The color of the hair is brown at the bottom, black near the tips, and hoary at the points; those on the back undulated, inside of the legs, yellowish-brown; tail, tufted with black. According to Pennant it is called the *meer-rat* at the Cape. It also resembles the ichneumons in habits, and its urine is very fetid. It eats flesh, preys on mice, and devours quantities of cockroaches. Sometimes it is domesticated for the purpose of exterminating vermin.

SURINAM. See GUIANA, DUTCH.

SURINAM BARK. See ANDIRA.

SURMOUNTED, in heraldry, a term used to indicate that one charge is to be placed over another of different color or metal, which may respectively be blazoned: Sable, a pile argent surmounted by a chevron gules; and, argent, a cross gules, surmounted by another or.

SURMULLET, *Mullus*, a genus of acanthopterous fishes of the family *mullidæ*, a small family formerly included in *percidæ*, but distinguished by having two dorsal fins widely separated from one another, the first spinous; and large, easily detached, strongly ciliated scales on the head and body. The genus *mullus* has no teeth on the upper jaw, but a disk of pavement-like teeth on the front of the vomer. Two long barbels hang from the under jaw, or, when not in use, are folded up against it. Only two species are known, both abundant in the Mediterranean, and both found on the British coasts. They very generally receive the name MULLET, by which they are confounded with a very different genus. The STRIPED SURMULLET, or STRIPED RED MULLET (*M. surmuletus*), is sometimes very plentiful on the southern coast of England, but is rarer toward the north. It approaches the shores in summer, and many surmulletts are then taken in mackerel nets; but at other seasons it is only obtained from comparatively deep water by trawl-nets. It sometimes attains, in the Mediterranean, a weight of six or seven pounds, but has never been known much to exceed three pounds in the British seas, and is seldom more than two pounds in weight. The ancient Romans, who held it in the highest esteem, gave prodigious prices for fish of unusually large size. They kept surmulletts in their *vivaria*; but there the fish did not increase in size. The color is pale pink, with three or four yellow longitudinal stripes; but where any of the scales have been rubbed off, beautiful tints of purple and bright red appear, which takes place also during the struggles of the fish when dying, and the Romans were therefore accustomed to bring surmulletts alive into their banquetting-rooms, that the guests might see them die, and enjoy the brilliant display of color, before eating the fish. The liver was regarded as peculiarly delicious, and was bruised in wine to make a *garum* for the flesh. The surmullet is still regarded as one of the best of fishes.—The RED SURMULLET, or PLAIN RED MULLET (*M. barbatus*), is very rare on the coasts of Britain. It is a much smaller fish than that already described. Other species of *mullidæ* are found in tropical seas.

SURNAME (either from its being an additional name—Fr. *surnom*, Ital. *sopranome*—or from the practice of writing it over the Christian name, which is to be seen in the court rolls and other ancient muniments), in modern Europe, the family name. The Roman *cognomen* partook somewhat of the same character; but the introduction of the surnames of modern time cannot be traced further back than the latter part of the 10th century. See NAME.

SURPLICE (Lat. *super pellicium*, above the robe of fur), a linen or muslin vestment, worn by clerks of all degrees of orders in the discharge of their public religious offices. It is by some supposed to be derived from the longer and more flowing vestment which, in the Roman Catholic church, is still used in the mass, and is called the "alb," but in that church the surplice is worn not alone by priests, but by all who have been admitted even to the church tonsure. Its most ordinary use is for the service of the choir, and it is also employed, along with the stole, by priests in the administration of the sacraments, and in preaching. The use of the surplice was strongly objected to by the Calvinistic

and Zwinglian reformers on the continent, and by the Puritans in England, who regarded this vestment as a relic of popery, and made it the subject of vehement denunciations. The argument against it is to be found in Beza, *Tractat. Theolog.*, iii. 29, and its defense in Hooker's *Ecclesiastical Polity*, book v., ch. 29. Ere ritualism became so common in England, no little stir used from time to time to be created by the use of the surplice by the preacher in the pulpit, contrary to the more general practice in the Anglican church. Preaching in the surplice has been associated in the popular mind with a Romanizing tendency, although it is difficult to say on what basis this association rests.

SURREY (Sax. *Suth-ric*, the s. kingdom), an inland co. in the s. of England, bounded on the n. by Middlesex, and on the e. by Kent. Area, 483,178 acres; pop. '91, 1,730,871. The middle of the county is traversed from w. to e. by a well-marked ridge of the North Downs, which rises in Botley Hill, above Titsey, to the height of 880 feet. On the n. side of this range, the land slopes gradually to the banks of the Thames, which runs along the northern border; but on the s. side, the descent is rugged and broken, affording pleasing and sometimes romantic scenery. Surrey of the main range, and about four miles south of Dorking, is Leith Hill, 993 ft. high, the most important elevation in this quarter of the country. Stretching along the southern bank of the Thames, and extending over a space about 6 m. in breadth, is a tract which belongs to the London clay formation; further south, and likewise extending from w. to e., there is a tract of plastic clay, varying in breadth from one to five miles. Chalk, weald clay, and iron sand formations occupy the s. of the county. The principal streams are the Mole and Wey, tributaries of the Thames. The soil of the northern half of the county is fertile; in the w. and s.w. the land is, to a great extent, covered with heath. The climate is soft and mild in low-lying districts, and is favorable to the production of corn and grass. More than four-fifths of the entire area are under culture. In the n., in the vicinity of London, there are numerous market-gardens, the produce of which is sent to supply the markets of the metropolis. Hops, wheat, and the ordinary crops are raised. The county contains much wood, and the beauty of the scenery, and the facility of communication with London, have attracted many residents to Surrey, which is consequently studded over with mansions and villas. Manufactures are carried on in Southwark and in the other southern suburbs of London, as well as in Croydon, Guildford, Kingston, and Reigate, which are the principal towns. The county returns four members to the house of commons.

SURREY, HENRY HOWARD, Earl of, 1516-47; b. England; son of the third duke of Norfolk. His youth was spent in France, and at the court of Henry VIII. In 1540 and for some years later, he served in France and gained the title of field marshal; he captured Boulogne, was made its governor, and gained other victories, but was recalled to England after some slight reverses at St. Etienne. His influence at court was no longer as powerful as in the life of the duke of Richmond, Henry's natural son; charges of treasonable ambition were constantly urged against the duke of Norfolk and Surrey by the Hertford faction; and in 1546 the two were arrested; Norfolk was sent to the Tower, and Surrey was beheaded, 1547. As a poet he was the first to introduce the sonnet and blank verse in English poetry. He wrote many sonnets, amatory verses, and elegies, and an elegant translation of parts of the *Æneid*.

SURROGATE, an officer having jurisdiction over the personal property of decedents, and often a special jurisdiction over their real estate. The surrogate in England was a representative of the bishop in the diocesan courts, which down to 1857 exercised jurisdiction over the probate of wills, and the issue of letters testamentary and of administration, as well as in matters ecclesiastical. As the bishop could not always hold his court in person, he appointed a "substitute," *surrogatus*, to represent him. Such substitutes, originally ecclesiastics, but in later times lawyers, acted as judges in probate matters; and the court of the Archbishop of Canterbury held by his surrogate was the principal court in probate, admiralty, and marriage matters. A separate court of probate and divorce was established in 1857. In New Jersey the surrogate is only an inferior officer of the probate court. In New York there is a surrogate's court in each county held by the county judge, unless the county has more than 40,000 inhabitants, in which case a surrogate is elected for 6 years. See **PROBATE COURT**.

SURTURBRAND, a kind of brown coal (q.v.) found in the north of Iceland, and there used for fuel. It has a great resemblance to the black oak found in bogs. It is capable of being made into tables and other articles of furniture, but is too brittle to be cut into shavings by a plane.

SURRY, a co. in n.w. North Carolina, drained by the Yadkin and the Ararat rivers; traversed in the n.w. by the Blue Ridge; area, 490 sq.m.; pop. '90, 19,281, incl. colored. The surface is hilly and heavily wooded. The soil is fertile in some portions. The principal productions are corn, tobacco, wheat, and live stock. Co. seat, Dobson.

SURRY, a co. in s.e. Virginia, drained by the James river, which bounds it on the n.e., and by the Blackwater river; area, 298 sq.m.; pop. '90, 8256, incl. colored. The surface is irregular and heavily wooded. The soil is sandy. The principal productions are corn, peas, and pork. Co. seat, Surry.

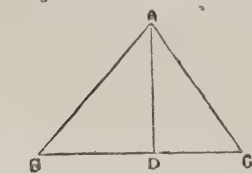
SURVEYING. Land-surveying may be considered the earliest practical application of the art of geometry or earth measurement, and must have been in some more or less

rude form coeval with agriculture and the division or appropriation of the soil. In Rome, surveying was considered one of the liberal arts, and the measurement of lands was intrusted to public officers who enjoyed certain privileges; and it is probable that the system of measurement practiced by them was very similar to our plane surveying with the chain and cross-staff of the present day, and has been handed down to us through the feudal period. An examination of ancient records and title-deeds will show that both areas and boundary-lines of the different inclosures forming fields, hundreds, town-lands, etc., are often laid down with a considerable degree of accuracy.

Land-surveying may be considered under the following heads: (a.) Plane surveying with the chain, and without the aid of angular instruments, except the cross-staff or fixed angle of 90°. (b.) Modern engineering surveying, in which angular instruments are used. (c.) Coast and military surveying. (d.) Trigonometrical surveying (q.v.).

The fundamental rule of every description of land-surveying, from the humble attempt of the village school-master to lay down an irregular garden-plot, to the trigonometrical survey of a large extent of the earth's surface, when the aid of the most refined improvements of modern science is indispensable, is simply to determine three elements of a triangle, and thence to calculate its area.

In plane surveying with the chain, the three sides of a triangle, ABC, are supposed to be accessible, and are carefully measured on the ground, and then laid down or platted to scale on paper, when an accurate figure of the triangle will be obtained, on which the length of the sides can be marked. To get the area, however, it will be necessary to determine the length of the perpendicular line AD, and this is usually done (when possible) on the ground by means of a simple instrument called a cross, which consists of two sights or fine grooves at right angles to each other, and being placed on the line BC (keeping B and C visible in one of the sights), nearly opposite the angle A, is moved gradually till the angle A is intersected by the other sight. The line AD can be also laid down on the drawing, and its length found by scale, and afterward verified on the ground, or it may be at once laid down on the ground by the use of the chain alone. An improved reflecting instrument, called an optical square, is also often used for this purpose. Any boundaries along the lines or sides of the triangle, ABC, can be determined by the use of offsets (q.v.) or insets, as they occur on right and left of line. No matter what the form of the surface to be surveyed may be—polygon, trapezium, or trapezoid—it may thus be determined by a judicious subdivision into triangles; and when the survey is not of a very extended nature or character, and when no serious obstructions exist, chain surveying is both accurate and expeditious, especially if proof or tie-lines are properly introduced, for the purpose of testing the accuracy of the work.



In every description of surveying, it is best to make the original triangle as large as possible, and to work from a whole downward, rather than build up a large triangle by the addition of several small ones. It would be impossible here to lay down rules to meet the many difficulties which arise in the practice of surveying, and indeed the best test of a good surveyor is the ease with which he will overcome local obstructions, which appear almost insurmountable to a novice, or even to a theoretical surveyor with little field practice.

Where buildings or other impediments are found in the measurement of a straight line, they are generally passed by the erection of short perpendiculars sufficient to clear the obstacles, and a line parallel to the original measured as far as they exist, when the original line can be again resumed. Differences of level, occurring in measuring a line where no instruments are used, are generally compensated or allowed for by the judgment of the surveyor.

In registering the dimensions taken on the ground, such as sides of triangles, offsets, intersections of roads, fences, etc., and everything necessary to make a perfect delineation or plan of the surface, surveyors use what is called a field-book, the mode of keeping which varies very much with individual practice. Some surveyors use hand sketches or rough outlines of the form of the ground, and mark the dimensions on them, while others use the ordinary form of field-book, or a combination of the two methods, which perhaps is the best when any difficult complications happen on the ground, such as the frequent occurrence of buildings, enclosures, water, etc., along the line. In the ordinary field-book, the center column, commencing from the bottom, represents the length of any line or side of a triangle; and the figures in the column, the distance at which the offsets to the right or left are taken, or where roads, streams, fences, etc., cross the line, or buildings adjoin the same. We give below the field-book of the assumed survey of the triangle ABC, with the different offsets and insets on its sides, and where roads, fences, streams, etc., cross them, the detail of which can be obtained by subdividing the triangle into smaller internal ones. The figure can thus be laid down from the book, and its area calculated by the formula $\frac{AB \times CD}{2}$ and the offsets and insets calculated, added, or deducted, by the methods given in OFFSETS.

Ponds, plantations, and enclosures of different kinds may be surveyed with a chain,

the longitude. Cable determinations of the longitude of Cambridge, from Greenwich, gave in

| | | |
|-------------|-----------------------------|--------------------|
| 1866 by the | Anglo-American | 4hrs. 44m. 31 sec. |
| 1870 " " | French cables to Duxbury | " " 30.99 " |
| 1872 " " | French cables to St. Pierre | " " 30.96 " |

From the system of large triangles is formed a system of smaller ones, that take in the details of the country. The maps are made on a scale from $\frac{1}{50000}$ to $\frac{1}{200000}$. A chain of triangles is generally run in the direction of the meridian, and other chains run perpendicular to it. By measuring the length of a degree near the equator, and one near the pole, the ellipticity of the earth can be calculated. In 1740 the French measured an arc of a meridian in Peru, and also one in Lapland, and the results have ever since been important in all investigations upon the figure of the earth. In the progress of all the national surveys, portions of the meridional arc have been measured. The coast survey has measured one from Nantucket to Farmington, Me., another from the Ocracoke inlet, N.C., to the head of Chesapeake bay. F. R. Hasslet, the first superintendent of the coast survey, began work in 1817. A system of primary triangles is now being carried across the continent, to combine the surveys of the Atlantic and Pacific coasts. The ordnance survey of Great Britain was begun in 1791. The extreme accuracy required in the field operations makes the progress slow; sometimes a whole season is needed for the observations at one station. Piccard, in 1669, made the first accurate measurement of a meridional arc, and the results obtained were used by Newton in demonstrating the law of gravity.

SŪRYA, in Hindu mythology, the god of the sun. His wife is, in later mythology, *Sārya*, who, in order to escape his embraces, transformed herself into a mare, but nevertheless became the mother by him of the twins *Aswins*, afterwards the heavenly physicians.

SURVILLE, MARGUERITE ÉLÉONORE CLOTILDE DE VALLON-CHALYS DE, 1405-80; is said to be the writer of poems first collected in 1803 by Vanderbourg. Some ascribe them to one of her descendants, the marquis Joseph Etienne de Surville, and others think these poems were written by the publisher Vanderbourg himself.

SUS, a district in Morocco, on the Atlantic ocean, between the Asaka river and the Atlas mountains; about 11,000 sq.m.; pop. about 750,000. The surface is mountainous.

SU'SA (Shushan in Daniel, Esther, etc., derived by some from shoshan, a lily), probably the modern Sus or Shush, in lat. 32° 10' n., and long. 48° 26' e., situated between the Chapses or Eulæus (Ulai in Daniel), and the Shapur, anciently the capital of Susiana (the *Elam* of Scripture, mod. *Khusistan*), and one of the most important cities of the old world. Its foundation is variously ascribed by ancient writers to Darius Hystaspes, or to Memnon, the son of Tithonus; and its name, together with its ground-plan, is traced on Assyrian monuments at the time of Assur Bani Pal, about 660 B.C. At the time of Daniel's vision "at Shushan in the palace," it was under Babylonian dominion, but came, at the time of Cyrus, under Persian rule; and the Achæmenian kings raised it to the dignity of a metropolis of the whole Persian empire, and as such Æschylus, Herodotus, Ctesias, Strabo, etc., speak of it. At the Macedonian conquest it was still at its height, and Alexander is reported to have found in it vast treasures, together with the regalia. On Babylon becoming the principal city of Alexander and his successors, Susa gradually declined, but seems still to have contained enormous wealth at the time of its conquest by Antigonus (315 B.C.). It was once more attacked by Molo in his rebellion against Antiochus the Great; and during the Arabian conquest of Persia it held out bravely for a long time, defended by Hormuzan. The ruins of its ancient buildings, the palace described in Esther among them, cover a space of about three miles. The principal existing remains consist of four spacious artificial platforms above 100 ft. high. Traces of a gigantic colonnade were laid bare by Loftus, with a frontage of 343 ft. and a depth of 244. Cuneiform inscriptions exist, together with many other relics similar to those found at Persepolis (see PERSEPOLIS; compare also CUNEIFORM). The "tomb of Daniel" shown near Susa is a modern Mohammedan building. Besides the valuable works of Loftus, important excavations have been made on the site by Churchill, Dieulafoy, and others. See Dieulafoy, *L'Acropole de Suse* (1890) and Billerbeck, *Susa* (1893).

SU'SA (anc. *Segusio*), a city of northern Italy, province of Turin, stands on the right bank of the Dora Riparia, at the foot of the Cottian Alps, 32 m. w. of Turin. It is an episcopal see, and has a cathedral consecrated in 1028. Among its other notable buildings are the episcopal palace, the town hall, and the Borgo de' Nobili. The surrounding country produces wines, fruits, mulberry-trees, and wood. The road over Mont Cenis, opened in 1810, begins at Susa. Pop. '81, 3303.

Susa, called by the Romans *Segusio*, is a very ancient city; it was founded by the Celts, and was, in the reign of Augustus, the capital of the Celtic chief Cottius, from whom the Cottian Alps received their name, and during the empire was the starting point for crossing Mont Cenis. A triumphal arch, erected by Cottius A.D. 8, in honor of Augustus, still remains.

SUSA, a port of Tunis on the gulf of Hammamet in the Mediterranean sea. It is surrounded by old walls, and in the neighborhood are large plantations of olives and vines. It is the seat of a court and carries on considerable trade in olive oil, grain, wool, etc. A railway line connects it with the cities of Tunis and Cairoan. The roadstead is bad, and the depth along the quays is only about 4 feet. Susa is the site of the Roman city of Hadrumetum. Pop. about 18,000, including the garrison and some 4000 Europeans and 1000 Jews.

SUSANNAH, HISTORY OF, *The Judgment of Daniel*, also *Susannah and the Elders*, are the different titles of a well-known story, which forms one of three apocryphal additions to the book of Daniel; the others being *The Song of the Three Holy Children* and *The History of Bel and the Dragon* (see **BEL AND THE DRAGON**). Susannah, the wife of Joiachim, and daughter of Hilkiiah, celebrated alike for her beauty and her virtue, was falsely accused of adultery by certain "lovers," whose advances she had spurned; and how, being condemned to death on their evidence, she was saved by the wise Daniel, who tore the mask from her enemies, and caused them to experience the fate they had designed for her. The question—not a very important one certainly—has been much debated, both in the early and later times of the church, whether or not the story of Susannah is true; and arguments (of various weight) have been adduced to show that the book is a fabrication, a fable, a legend, and a history. The most probable view, perhaps, is that which regards it as a tradition of something that did happen in the life of Daniel, but which has been molded into a moral fiction by the hand of a literary artist. The original is believed to have been Greek and not Hebrew. In most MSS. it precedes the first chapter of the book of Daniel, and so we find it in the old Latin and Arabic versions; but the LXX., the Vulgate, the Complutensian Polyglot, and the Hexaplar Syriac place it at the end of the present book, and reckon it as the 13th chapter.

SUSPENSION, in music. A note is said to be suspended when it is continued from one chord to another to which it does not properly belong, and to a proper interval of which it must eventually give way.

SUSPENSION BRIDGE, a former town and port of entry in Niagara co., N. Y.; on the Niagara river; 13 miles s. of lake Ontario, and about 20 miles n. of Buffalo. In 1892 the town and the village of Niagara Falls were consolidated and incorporated as the city of Niagara Falls (q. v.).

SUSPENSION BRIDGES. In these bridges the roadway is suspended from cables passing over piers or towers, and firmly fixed at their extremities. When the roadway is equally loaded over its length, the curve of the cable is approximately a parabola. The weight of the roadway being known, the strain upon the cable, and its requisite strength, are readily determined. For example, in fig. 1, if A be the center of the bridge, and it be required to find the strain upon the cable at the point B, it is evident that the weight of the roadway between A and B is supported by the cable at B; we have then to find what strain in the direction of the length of the cable will support this vertical load. By the principles of mechanics, if we draw a right-angled triangle BCD, of which the side BC is a tangent to the curve at B, CD is vertical, and BD horizontal; and if the length of CD represent numerically the load on AB, then BC will represent numerically the strain on the cable produced by that load, and BD will be what is called the horizontal component of this strain. This horizontal part of the strain is the same for every part of the curve; it is the total strain on the cable at the center A, and the strain carried over the towers and balanced by the backstays, which are firmly anchored to the ground behind them. In this manner the conditions of strength and stability of a bridge uniformly loaded are easily determined, but when we have a rolling load which is heavy in proportion to the weight of the bridge, as, for example, a railway train, the case is very different, for when the train only occupies one half of the bridge, the cable will be depressed toward that side, and raised at the center; thus an undulation will be produced in the bridge, which, if the train be moving rapidly, would endanger its stability. Various combinations have been devised to overcome this difficulty. The most simple, and practically the best, is to stiffen the roadway so that the strain of the passing load is distributed over a considerable length of the cable. In this manner large railway bridges have been constructed in America; among them is that over the Niagara above the falls, with three lines of rails on it, of which the span is 822 ft., and the height of the platform above the river, 250 feet; it is supported by four wire cables, each containing 3640 wires. Trains pass over it at the rate of 10 m. per hour. An ordinary suspension bridge is liable to both vertical and horizontal oscillations, the former taking place when a train or other load is passing over it, and the latter being due to the action of the wind. These oscillations cannot be altogether prevented, but can be so reduced as to be harmless by the use of stays, stretching both from the towers and from points on shore to various parts of the bridge. Suspension bridges are generally used in positions where the span is great, and the rolling loads neither great in proportion to the weight of the bridge itself, nor very rapid in their motion. Many beautiful examples are to be seen in Great Britain; among others, we may instance the Menai bridge, 580 ft. span, and the Clifton bridge, near Bristol, 703 ft. span. For other suspension bridges see **BRIDGE** and **RAILWAY**.



FIG. 1.

SUSPENSION OF ARMS. See TRUCE.

SUSQUEHANNA, an American river, rises as the North Branch in Otsego lake, in Otsego county, New York, and, flowing south-westward, receives the rivers Unadilla and Chenango, then, turning south, enters Pennsylvania, where it receives the Chemung, Lackawanna, West Branch, and the Juniata, and empties itself into the Chesapeake bay, at Havre de Grace, Md., 400 m. from its source, and 153 from its junction with the West Branch. It is a shallow, rapid, mountain river, with varied and romantic scenery. A canal was built along the main stream and branches, but the railroads have absorbed most of its former traffic. The river near its mouth is famous for water-fowl, especially the canvas-back duck, and has important fisheries.

SUSQUEHANNA, a co. in n. e. Pennsylvania, adjoining New York; drained by the Susquehanna river and several creeks; traversed by the Delaware, Lackawanna and Western, and the Erie railroads; area, 850 sq. m.; pop. '90, 40,093, chiefly of American birth, with colored. The surface is uneven, but not rugged. There are fine dairy and stock-breeding farms; oats, corn, wheat, potatoes, butter, and cattle are staples. Co. seat, Montrose.

SUSRUTA is one of the great medical authorities of ancient India. See *Medicine*, under SANSKRIT LITERATURE. His work is called *Ayurveda*, and consists of six books. It was edited by S'ri Madhusūdana Gupta, in two vols. (Calcutta, 1835-36.)

SUSSEX, a co. in s. Delaware, adjoining Maryland, bounded on the e. by the Atlantic ocean and the Delaware river; drained by Indian and Nanticoke rivers, and Mispillion creek; traversed by branches of the Philadelphia, Wilmington, and Baltimore railroad; area, 900 sq. m.; pop. '90, 38,647, includ. colored. The surface is level and heavily wooded. The soil is generally fertile. The principal productions are corn, wheat, and cattle. Co. seat, Georgetown.

SUSSEX, the n.w. co. of New Jersey, bordering on New York, separated from Pennsylvania on the w. by the Delaware river; 525 sq. m.; pop. '90, 22,259. The surface is hilly and the soil very fertile. This county produces the largest amount of butter of any in the state. It contains large deposits of iron, zinc, slate, limestone, and franklinite — a rare mineral. Co. seat, Newton.

SUSSEX, a co. in s. e. Virginia, drained by Stony creek, Nottaway and Blackwater rivers; 420 sq. m.; pop. '90, 11,100, chiefly of American birth, includ. colored. It is intersected by the Atlantic Coast Line and the Norfolk and Western railroads. Its surface is hilly and largely covered with forests, which supply the lumber, which is the principal source of revenue. The soil is fertile, producing grain, tobacco, and dairy products. Co. seat, Sussex.

SUSSEX (South-Saxons), a maritime co. in the s. of England, bounded on the n. by Surrey and Kent, on the s. by the English channel, and on the w. by Hampshire. Area, 936,911 acres; pop. '91, 550,442. The South Downs (see Downs) traverse the county from w. to e., ending about 20 m. e. of Brighton, in the lofty cliff of Beachy head. The northern escarpment of the Downs is precipitous, but leads down to the fertile and richly wooded district of the Weald (see Downs). A remarkably productive tract, from 2 to 7 m. in breadth, extends w. from Brighton along the coast to the Hampshire border; and in the s. e. of the county the rich marsh lands that line the coast, and which are 30,000 acres in extent, make excellent pasture-grounds. Of the Down-land there are about 50,000 acres, covered with a fine, short, and delicate turf, on which the well-known breed of Southdown sheep are pastured. The principal industries of the county are agriculture and cattle-raising. The manufactures are unimportant. Sussex was at one time the center of English iron manufacture, the ironstone from which iron was extracted being found throughout the inland districts; but the last forge was extinguished, at Ashburnham, in 1809. Recently thick beds of gypsum have been found by boring and are now being worked at Netherfield. The chief rivers are the Arun, Adur, and Ouse, which have their origin in the n. of the county, and flow s. into the channel. In the s. of Sussex the climate is mild, and several large towns (see BRIGHTON and HASTINGS) are largely resorted to by those who seek health or relaxation. Seaford and Pevensey bays are much frequented by vessels, and the e. portion of the coast is defended by martello towers. Sussex is divided into six parliamentary districts,—of Chichester, Eastbourne, E. Grinstead, Horsa-ham, Lewes and Rye, each returning one member. Capital, Chichester.

SUSTENTATION FUND, a fund provided in the Free Church of Scotland for the support of the ministers of the church. The idea of such a fund was probably derived by Dr. Chalmers from the system of the Wesleyan Methodists, and a scheme devised by him was made public before the disruption, so that arrangements had been made, and a small sum already collected, when that event took place. The scheme was afterward carried into operation throughout the whole of Scotland, and continues unmodified to the present time. The members of the church are called upon to contribute, according to their own will and ability, to a common fund; of which, after payment of expenses, payments to a fund for widows and orphans, pensions to retired ministers, etc., an equal division is made among the ministers of the church, with a few exceptions, chiefly in the

case of newly formed congregations. The amount of the fund has gradually increased from £68,704 in 1843-44, to £172,408 in 1879-80, when 796 out of 1097 ministers received an equal dividend of £160, the surplus being divided among the ministers (780) of those charges whose contributions amounted to a certain average sum per member. Congregations are permitted to supplement the stipends of their own ministers, and if able are expected to do so. The supplement in some congregations in towns much exceeds the dividend from the fund; but in many parts of the country, the whole, or almost the whole stipends of the ministers are derived from it. The question had been much discussed, whether an equal dividend ought to be made, or a proportion established between the liberality of a congregation and the amount paid to its minister. The subject of the sustentation fund is of interest, not only to the Free church of Scotland, but to all unendowed churches.

SUTHERLAND, a co. in the extreme n. of Scotland, is bounded on the e. by Caithness and the North sea, on the n. and w. by the Atlantic, and on the s. by Ross and Cromarty. Area, 1,207,188 acres; pop. '91, 21,896, or about 11 per sq. mile. The coast-line is 60 m. in extent; and the shores, rugged on the n. and w., where they are broken by the force of the Atlantic, are comparatively flat on the east. The southern and central regions of Sutherland are the most elevated; and rivers, mostly from the middle of the county, flow e. and s.e. to the North sea, and n., n.w., and w. to the Atlantic. The principal mountain peaks are Ben More in Assynt (3273 ft.), and Ben Clibrigg (3154 ft.), while numerous other summits attain a height of over 2000 feet. The chief rivers are the Oikel and the Shin — which, with other affluents, unite to form Dornoch firth — the Brora, Helmsdale Water, and Naver. Extensive moors, the haunt of herds of red deer, stretch across the county; and the rivers and lakes, the chief of which are Loch Shin (q. v.), Loch Naver, and Loch Laoghall, form numerous low-lying valleys or straths. In the interior and western districts the climate is cold, and the county is often deluged with continuous rains; but in the eastern districts the climate is mild, and the soil very fertile in all agricultural produce. Coal, granites of various colors, marble, limestone, etc., are found. In Nov., 1868, traces of gold were found in a burn in Sutherland. A number of "diggers" were attracted to the district, but the gold found, though of excellent quality, was hardly sufficient to repay their labor. The Highland railway passes through the county. Manufactures are inconsiderable. There are good salmon, herring, and white fishings. Sutherland is well supplied with churches. The schools are well attended, and Gaelic is rapidly giving way to English. Almost the whole of the county belongs to the duke of Sutherland. The late duke was eminent for the zeal with which he devoted himself to the improvement of Sutherland, spending large sums in the reclamation of land by steam-plows, the construction of railways, etc. The chief town is Dornach, with a population of (1891) 514. The county sends one member to Parliament.

Sutherland receives its name from the Northmen, who frequently descended upon and pillaged it prior to the 12th c., and called it the southern land, as being the limit on the s. of their settlements. The condition of the people of Sutherland before 1811, in which year the county began to be opened up by roads, was miserable. Their sustenance, dependent mostly upon their half-starved flocks, was very precarious, and would have failed them often had not charity administered relief. A former duke of Sutherland effected what are known as the "Sutherland clearances," by compelling such of his tenants as could not support themselves, owing to the unsuitability to agricultural purposes of the districts upon which they dwelt, either to remove to more fertile districts, where they received land at a merely nominal rent, or to emigrate at his expense to Canada.

SUTHERLAND, GEORGE GRANVILLE WILLIAM SUTHERLAND-LEVESON-GOWER, Duke of Sutherland; b. England, 1828; succeeded to the dukedom on the death of his father, the second duke of the name, 1861. His mother, Harriet Elizabeth Georgiana, 1806-68, daughter of the earl of Carlisle, was noted for her beauty and as the patroness of the English anti-slavery society, and of other movements of reform and benevolence. The present duke was a member of the house for ten years before his elevation to the peerage, has immense estates in Sutherlandshire, Staffordshire, Shropshire, and Ross-shire. In 1881 the duke of Sutherland made a visit to this country, mainly for the purpose of examining our railroad system.

SUTLEJ, SATLEJ, or SUTLUJ (Sansk. *Satadru*, Thibet. *Langtschan*), an important river in the n.w. of India, the eastmost of the five rivers of the Punjab, rises in southern Thibet, not far west from the sources of the Brahmaputra and south of those of the Indus. After passing through the lakes of Manasarowar and Rakas Tal it flows n.w. for 150 m., when turning to the s.w. and breaking through the Himalayan range, it enters British territory and receives the Spiti or Li, a larger stream than itself. The Spiti is 8592 ft. above sea-level, when it joins the Sutlej, and the scene of the confluence of the two rivers is sublime in the highest degree. After flowing in all about 850 miles, in the course of which it is joined by the Beas and the Chenab, it falls into the Indus in lat. about 29° north. Its upper course is supposed to be identical with the Hesudrus, and its lower course (in which it is called the Ghara) with the Hyphasis of the ancients.

SUTLER, is a vendor of provisions allowed by the quartermaster-general to follow an army in the field, for the purpose of supplying the soldiers with such luxuries as they can afford to purchase. Sutlers are under martial law, accompany the baggage on a march, and are narrowly watched, and severely punished if found guilty of any irregularities toward either the soldiers or inhabitants of the country. In the French army a soldier in each regiment is licensed to act as sutler, and is called *vivandier*. See also CANTEEN.

SŪTRA (from the Sanskrit *śiv*, to sew, literally, therefore, a thread or string) is, in Sanskrit literature, the technical name of aphoristic rules, and of works consisting of such rules. The importance of the term will be understood from the fact, that the *groundworks* of the whole ritual, grammatical, metrical, and philosophical literature of India are written in such aphorisms, which therefore constitute one of the peculiarities of Hindu authorship. The object of the Sūtras is extreme brevity; and, especially in the oldest works of this class, this brevity is carried to such an excess, that even the most experienced would find it extremely difficult, and sometimes impossible, to understand these aphorisms without the aid of commentaries, which, however, are fortunately never wanting, wherever a work is written in this style. Though there is no positive evidence as to the cause or causes which gave rise to this peculiarity of Hindu composition, the method of teaching in ancient India—an account of which is afforded in some of the oldest works—renders it highly probable that these Sūtras were intended as memorial sentences which the pupil had to learn by heart, in order better to retain the fuller oral explanation which his teacher appended to them. But it is likewise probable that this method of instruction itself originated in the scarcity or awkwardness of the writing material used, and in the necessity, therefore, of economizing this material as much as possible; for that writing was known and practiced at the remotest period of Hindu antiquity, is now placed beyond a doubt, though a startling theory was propounded, some years ago, to the effect that writing was unknown in India, even at the time of the great grammarian Pāṇini. The manner, however, in which, up to this day, the Hindus are in the habit of keeping the leaves of their books together, seems to throw some light on the name given to this aphoristic literature. The leaves—generally narrow, and even at the present time often being dried palm leaves, on which the words are either written with ink or scratched with a style—are piled up, and, according to the length of the leaves, pierced in one or two places, when, through the hole or holes, one or two long *strings* are passed to keep them together. The name of Sūtra was probably, therefore, applied to works, not because they represent a thread or string of rules, but on account of the manner in which these works were rendered fit for practical use; just as in German a volume is called *band*, from its being “bound.” That a habit deeply rooted outlives necessity, is probably also shown by these Sūtra works; for while the oldest works of this class may be called Sūtras by necessity, there are others which convey the suspicion that they merely imitated the Sūtra style after the necessity had passed away, more especially as they do not adhere to the original brevity of the oldest Sūtras; and the Sūtras of the Buddhists (see PĪṬAKA), conspicuous for their prolixity, could scarcely lay claim to the term, if compared with the Sūtra of the Brahmanical literature.

SŪTRO TUNNEL. See TUNNEL.

SUTTEE (an English corruption from the Sanskrit *sati*, a virtuous wife) means the practice which prevailed in India, of a wife burning herself on the funeral pile, either with the body of her husband, or separately, if he died at a distance.

The practice of suttee is based by the orthodox Hindus on the injunctions of their Sāstras, or sacred books, and there can be no doubt that various passages in their Purānas (q.v.) and codes of law countenance the belief which they entertain of its meritoriousness and efficacy. Thus, the *Brahma-Purāna* says: “No other way is known for a virtuous woman after the death of her husband; the separate cremation of her husband would be lost (to all religious intents). If her lord die in another country, let the faithful wife place his sandals on her breast, and, pure, enter the fire. The faithful widow is pronounced no suicide by the recited text of the *rigveda*.” Or the code of *Vyāsa*: “Learn the power of that widow who, learning that her husband has deceased, and been burned in another region, speedily casts herself into the fire,” etc. Or the code of *Angīras*: “That woman who, on the death of her husband, ascends the same burning pile with him, is exalted to heaven, as equal in virtue to Arundhati (the wife of Vasishtha). She who follows her husband (to another world) shall dwell in a region of joy for so many years as there are hairs on the human body, or 35 millions. As a serpent-catcher forcibly draws a snake from his hole, thus drawing her lord (from a region of torment), she enjoys delight together with him. The woman who follows her husband to the pile expiates the sins of three generations on the paternal and maternal side of that family to which she was given as a virgin. . . . No other effectual duty is known for virtuous women, at any time after the death of their lords, except casting themselves into the same fire. As long as a woman (in her successive transmigrations) shall decline burning herself, like a faithful wife, on the same fire with her deceased lord, so long shall she be not exempted from springing again to life in the body of some female ani-

mal. When their lords have departed at the fated time of attaining heaven, no other way but entering the same fire is known for women whose virtuous conduct and whose thoughts have been devoted to their husbands, and who fear the dangers of separation." See for other quotations, H. T. Colebrooke, *Digest of Hindu Law*, vol. ii. p. 451, ff. (Lond. 1801); and his "Essay on the Duties of a faithful Hindu Widow," reprinted from the *Asiatic Researches*, in his *Miscellaneous Essays*, vol. i. (Lond. 1837). But how-ever emphatically these and similar passages recommend a wife to burn herself together with her deceased husband, it should, in the first place, be observed, that *Manu*, who among legislators of ancient India, occupies the foremost rank, contains no words which enjoin, or even would seem to countenance, this cruel practice; and, secondly, that no injunction of any religious work is admitted by the orthodox Hindus as authoritative, unless it can show that it is taken from or based on, the revealed books, the Vedas (see *SKRUTI*). An attempt has of late years been made by rājā Rādhakānt Deb, to show that, in a text belonging to a particular school of the black Yajurveda (see *VEDA*), there is really a passage which would justify the practice of suttee; but in the controversy which ensued on this subject between him and the late Prof. H. H. Wilson, it clearly transpired that the text cited by the learned rājā is of anything but indubitable canonicity; moreover, that there is a verse in the *rigveda* which, if properly read, would enjoin a widow not to burn herself, but, after having attended the funeral ceremonies of her husband, to return to her home, and to fulfill her domestic duties; and it seems, at the same time, that merely from a misreading of a single word of this verse from the *rigveda*, that interpretation arose which ultimately led to a belief and an injunction so disastrous in their results. See H. H. Wilson, "On the supposed Vaidik Authority for the Burning of Hindu Widows, and on the Funeral Ceremonies of the Hindus," reprinted from the *Journal of the Royal Asiatic Society*, vol. xvi., in his works, vol. ii., edited by Dr. Rost (Lond. 1862). That an immense number of widows have fallen victims to this erroneous interpretation of the oldest Vedic text, is but too true. Some fifty years ago, however, the East India company took energetic measures to suppress a practice which it was perfectly justified in looking upon as revolting to all human feelings, and which it would have likewise been entitled to consider as contrary to the spirit of the Vedic religion. This practice may now be said to have been successfully stopped; for though, from habit and superstition, even nowadays cases of suttee occur, they are extremely rare, and all reports agree that the enlightened natives everywhere, except, perhaps, in certain native states, support the action of government to repress this evil of bygone times.

SUTTER, a co. in n. central California; drained by the Sacramento and Feather rivers; traversed by the Southern Pacific railroad; about 590 sq. m.; pop. '90, 5469, chiefly of American birth. The surface is mostly level prairie, without timber. The soil is fertile. Co. seat, Yuba City.

SUTTER, JOHN AUGUSTUS, 1803-80, b. Baden; an officer in the Swiss service, who emigrated to this country in 1834, and became a trader at Santa Fé. In 1838 he made his way to the Pacific coast, thence to the Sandwich islands, and thence to Alaska, on his voyage from which down the coast, he was wrecked in San Francisco bay in 1839. Obtaining a grant of Mexican land, he established in 1841 a settlement called New Helvetia, where the city of Sacramento now stands. He was governor of the n. district of California under the Mexicans, and alcalde and Indian agent after it passed to the United States. In Feb., 1848, while enlarging his saw-mill race, he discovered gold. The discovery, however, brought him disaster. Gold diggers pre-empted his lands, and besides an annual pension of \$3,000, he received nothing else. He settled in Pennsylvania in 1873.

SUTTON, a co. in w. Texas; 1620 sq. m.; pop. '90, 658. Co. seat, Sonora.

SUTTON, a tp. in Meigs co., Ohio, including Racine vill. Pop. '90, 3750.

SUTTON, Amos, 1798-1854, b. Kent, England; in 1824 became a missionary to India where nearly all his life was spent. He compiled various text books in the Oriya language, and translated the Bible and many tracts into the same tongue. He also published a hymn book and several religious books in English.

SUTURE (Lat. *sutura*, a seam) is a term employed both in anatomy and surgery. In anatomy, it is used to designate the modes of connection between the various bones of the cranium and face. A suture is said to be *serrated*, when it is formed by the union of two edges of bone with projections and indentations (like the edge of a saw) fitting into one another. The coronal, sagittal, and lambdoidal sutures (see *SKULL*) are of this kind. A suture is termed *squamous*, when it is formed by the overlapping of the beveled (or scale-like) edges of two contiguous bones. There are also the *harmonia* and *schindylesis* sutures, the former being the simple apposition of rough bony surfaces, and the latter being the reception of one bone into a fissure of another.

In surgery, the word suture is employed to designate various modes of sewing up wounds, so as to maintain the opposed surfaces in contact. As it may fall to the lot of any person, on an emergency, to have to sew up a wound, the following general rules, applicable to all forms of suture, should be attended to. In passing the needle, the edges of the wound should be held in contact with the fore-finger and thumb of the left hand; and the needle should penetrate the surface at about an angle of 50° (rather more

than half a right angle), and should, at least, pass through the whole thickness of the skin at each stitch. The distance from the edge of the wound at which each stitch should enter and leave the skin, must vary with the depth of the wound; but there should never be less than the eighth of an inch between the margin of the wound and the entrance or exit of the needle. Sutures should not include vessels, nerves, muscles, or tendons. The line of the thread should cross that of the wound at right angles. For incised wounds on the surface of the body, when the edges can only be transfixed from the cutaneous surface, or when the opposite margins can both be traversed by one plunge, a curved needle (such as a common packing-needle) is most convenient, whereas a strong straight needle is more convenient for the completely free margins of extensive wounds, such as are left after amputation. Various forms of needles are used by surgeons. In the *twisted suture*, as used in the operation for hare-lip, the wound is transfixed by pins, around which, beginning with the uppermost, a thread is twisted.

SUVOROF, ALEXANDER VASSILIVITSH, Count, Prince Italiiski, a Russian field-marshal, and the most famous of Russian generals, was descended from a family of Swedish origin, and was born in Finland, Nov. 13 (O. S.), 1729. His father, who was an officer of the Russian army, and rose, in after times, to the rank of general and senator, enrolled young Suvorof at the age of 13, in the Semenof regiment, where he remained till 1754, when he was promoted to the grade of lieutenant. Suvorof was present in the Russian army engaged in the seven years' war (q.v.), and for distinguished behavior at Kunersdorf, received the grade of colonel. By a constant succession of eminent services in the Polish civil war (1768), in the war against the Turks (1773-74), in suppressing internal disturbances, and in subduing the Tartars of the Kuban (1783), he continued to grow in reputation, and rose to the rank of general. In the Turkish war (1787-92) he was commander-in-chief, for the first time brought the bayonet prominently into use in the Russian army, and decided by it the bloody battle of Kinburn (1787), which would otherwise have been a total rout. At the siege of Otchakof (1788), where he narrowly escaped being made prisoner, the battle of Fokshany (Aug. 1, 1789), which he gained in conjunction with the Austrians, and the decisive victory of Rymnik (Sept. 22, 1789), his headlong bravery, and peculiar system of rapid and repeated attack by overwhelming numbers, secured him complete success. For this last victory, which saved the Austrians under Coburg from annihilation or capture, Suvorof was created, by the Emperor Joseph II., a count of the empire, and from his own sovereign received the title of Count *Suvorof-Rymnikskii*. His last great achievement, and the one which has given a predominant coloring to Suvorof's reputation in western Europe, was the capture of Ismail (q.v.). Suvorof's report of his success was couched in the following terms: "Glory to God and Your Excellency; the town is taken; I am in it." He was then appointed (1791) governor of the newly conquered provinces; was afterward sent (1794) to complete the annihilation of the Polish monarchy, which he effected by repeated victories over the Polish armies, the capture of Praga by storm, and the *repossession* of Warsaw (Nov. 19), where a horrible massacre of the inhabitants took place. The grade of field-marshal, and presents of rare value, rewarded these successes. Under Paul, he fell into disgrace (1798), from his impatience of the emperor's fantastic military regulations, and was deprived of his rank; but being restored through English influence, he commanded the Russian auxiliary army sent to co-operate with the Austrians in Italy. In April, 1799, he reached Verona; compelled Moreau to retire behind the Adda with immense loss, including more than 8,000 prisoners; entered Milan in triumph (April 29); again defeated the French under Macdonald, after a desperate three days' conflict, at the Trebbia (June 17-19), and a third time at Novi (Aug. 15), depriving them of the whole of northern Italy. His campaign in Switzerland, which promised to bring him face to face with Massena, then the best general in Europe, was rendered abortive by the tardiness of the Austrians, and the Russians, in spite of Suvorof's remonstrances, were soon after recalled. His escape from the Schackenthal, where he was hemmed in by the French, is considered by many to be the most brilliant and daring retreat ever executed. While on his return to St. Petersburg, where a brilliant reception was awaiting him, he fell dangerously ill in Lithuania, and though, on his recovery, he found himself a second time in disgrace, he continued his route, and arrived privately in the capital, where he died sixteen days afterward, May 17, 1800. His remains were honored with a magnificent funeral, and the Czar Alexander erected a statue to his memory on the Champ-de-Mars. This most extraordinary man had naturally a weak constitution, but rendered it almost invulnerable by exercise, strict temperance, and the regular use of cold baths. His mode of life was of Spartan simplicity, and though the oddity of many of his habits seemed only calculated to encourage ridicule, they, in combination with his paternal care of his men, gave him a powerful hold on the affections of an army at once so ignorant and so thoroughly national in sentiment as the Russian. Suvorof, was inflexible in his resolutions and promises, and of incorruptible fidelity. His skill as a general has often been doubted, on the strength of his favorite remark, that all military tactics could be expressed in three words, *stoupai i bi*, "forward and strike;" but his career shows him to have been possessed of all needful military knowledge—though he hated idle maneuvering—and to have excelled in promptitude and ingenuity of conception, and boldness and rapidity of execution.

SUWAN'NEE, a co. in n. Florida, drained by the Suwannee, which bounds it on the w. and s.w.; intersected by the Florida Central and Peninsular railroad; about 640 sq.m.; pop. '90, 10,524, chiefly of American birth, inclu. colored. The surface is mostly level. The soil is sandy. The principal productions are cotton, corn, and sugar. Co. seat, Live Oak.

SUZERAIN (Fr. from Lat. *supremus*), a feudal lord. According to the feudal system, as developed in northern Europe, every owner of allodial lands was compelled to acknowledge himself the vassal of a suzerain and do homage to him for his lands. The term was applied less to the king than to his vassals, who had sub-vassals holding of them. See **ALLodium**.

SVENIGOROD KA, a t. of Russia, in the government of Kiev, 150 m. s. from Kiev, on an affluent of the Southern Bug. Pop. '80, 11,375.

SWABIA, **SUABIA** (Ger. *Schwaben*), or **SUEVIA**, an ancient duchy, in the s.w. of Germany, so named from a horde of Suevi, who spread over it in the 5th c., and amalgamated with the Alemanni, its previous inhabitants. It existed as a great duchy of the Frank empire till the 8th c., when Alsace and Rætia were separated from it, and the remainder, retaining its name of Swabia, was thenceforth governed by *nuntii camere*, or royal delegates, one of whom having, in 915, usurped the title of duke of Alemannia, was condemned by the German diet and decapitated in 917. Swabia at this time was bounded on the w. and s. by the Rhine, on the e. by the Lech (which separated it from Bavaria) and Franconia, n. by the palatinate of the Rhine and Franconia, and contained about 13,000 English sq. miles. In 918, however, Swabia was acknowledged as a ducal fief of the empire; and, after changing hands several times, was (1080) bestowed upon count Frederick of Hohenstaufen (q.v.), the founder of the illustrious house of this name, also known as the house of Swabia. Under the rule of this prince and his successors, Swabia became the most rich, civilized, and powerful country of Germany, and the ducal court was the resort of the minnesingers (q.v.); but the wars of the Guelphs and Ghibellines, and the quarrel with the French respecting Naples, put an end to the dynasty in 1268. The ducal vassals in Swabia rendered themselves almost independent, and professed to acknowledge no lord but the emperor. During these dissensions arose the lordships of Würtemberg and Baden, with numerous lesser states, holding direct of the crown, and opposed to them the cities, which strove also for an equal independence, and at last, in reward of important service, obtained in 1347 great additional privileges. A number of them united to make common cause against the neighboring feudal lords in 1376 (known as the *First Swabian League*); an opposite league was formed between Würtemberg, Baden, and 17 towns, in 1405, called the league of Marbach; and both took part in the war of Swiss independence, the former in support of the Swiss, the latter of the Austrians. At last the towns, which had been rapidly increasing in wealth and power, decided at Ulm, in 1449, to form a standing army and a permanent military commission for the forcible preservation, if necessary, of peace and order; and the count of Würtemberg, the most powerful of the opposite party, having joined them, was appointed military chief of the league, which ultimately grew up into the *Great Swabian League*, and exercised both administrative and judicial authority over the whole country, effectively repressing feudal quarrels. In 1512 Swabia became one of the ten circles into which Germany was now divided, received its complete organization in 1563, and retained it almost without change till the dissolution of the empire in 1806. But during this period the wars of the towns with Würtemberg, the peasants' war, of which Swabia was one of the foci, the thirty years' war, and those between France and the empire, destroyed the democratic constitution of the towns, and with it their energy, and then their prosperity disappeared, leaving now no relic which could suggest their former great political importance.

SWAIN, a co. in w. North Carolina, adjoining Tennessee; drained by the Little Tennessee river; bounded on the n. by the Great Smoky mountains; area, 425 sq.m.; pop. '90, 6577, with colored. The surface is even and well wooded. The soil is only partly fertile. The principal productions are corn, tobacco, and pork. Co. seat, Bryson City.

SWAIN, CHARLES, 1803-74; b. Manchester, England; called the "Manchester poet;" for 14 years employed in the dyeing establishment of his uncle, afterward became an engraver. While connected with the mill he began to write for magazines and annuals. He published various poems and sketches, some of which were translated into German and French. *Dryburgh Abbey*, an elegy on Sir Walter Scott, was written in 1832; new ed. 1868. An edition of his poems, with a portrait, and an introduction by Charles Card Smith, appeared in 1857. Wordsworth, Southey, and James Montgomery were among his friends. In 1857 he received a civil-list pension of £50 per annum.

SWAINSON, WILLIAM, b. England, 1789; served in the British army 1807-15. He studied natural history; went to South America in 1815, and afterward settled in London. He was at one time attorney-general of Tasmania, whither he had emigrated in 1841. He began the publication of *Zoological Illustrations* in 1820, and *Exotic Conchology* in 1821. Among his many works are *Naturalist's Guide* (1822); a number of natural history volumes in Lardner's *Cabinet Cyclopædia*. He died in New Zealand in 1855.

SWALE. See YORKSHIRE.

SWALLOW, *Hirundo*, a Linnæan genus of birds of the order *insessores*, and tribe *fissirostres*, now divided into a number of genera, which form the family *hirundinidae*. This family consists of birds which prey on insects, catching them in the air, and have great powers of flight, now soaring to a great height, now skimming near the surface of the ground or of the water, and wheeling with great rapidity. The bill is short and weak, very broad at the base, so that the gape is wide; the wings are very long, pointed, and more or less sickle-shaped when expanded; the legs are short and weak, and in some—the swifts (q.v.)—more so than those of any other birds. The tail is generally forked. The plumage is close and glossy. The species are very numerous, and widely diffused, being found in almost all countries. Such of them as occur in the colder parts of the world are summer birds of passage, migrating to warmer regions when winter approaches and insects disappear. The family is divided into two groups, *swifts*, which have remarkably long and curved wings, very small weak legs, and short toes, the hinder toes generally directed forward, and *swallows*—some of which are also called *martins*—having wings not quite so long nor so much curved, rather stronger legs, and longer toes, three before and one behind. The COMMON SWALLOW, or CHIMNEY SWALLOW (*hirundo rustica*), exhibits a character common to many other species, in the very long and deeply-forked tail, the two lateral feathers of which far exceed the others in length. The plumage is very beautiful, the upper parts and a band across the breast glossy bluish black, the forehead and throat chestnut, the lower parts white, and a patch of white on the inner web of each of the tail-feathers except the two middle ones. The whole length of the bird is about 8½ in., of which the outer tail-feathers make 5 inches. The nest is made of mud or clay, formed into little pellets and stuck together, along with straw and bents, and lined with feathers. It is open and cup-shaped, and is generally placed in a situation where it is sheltered from wind and rain, as a few feet down an unused chimney, under the roof of an open shed, or in any unoccupied building to which access can be obtained. Two broods are produced in a year. The migration of this and other British species of swallow, now recognized by all naturalists as an unquestionable fact, was formerly the subject of much dispute, and swallows were supposed by many to become torpid in winter, although it was difficult to imagine that if so they should not frequently be found in that state. The geographical range of these species extends over great part of Europe, Asia, and Africa.—The WINDOW SWALLOW, or HOUSE-MARTIN (*H. urbica*, or *chelidon urbica*), is another very common American species, glossy black above, white below, and on the rump; the feet covered with short downy white feathers, which is not the case in the chimney swallow; the tail long, but its outer feathers not remarkably so. The nest is built of mud or clay, like that of the chimney swallow, but is hemispherical, with the entrance on the side, and is attached to a rock, or, very frequently, to the wall of a house, under the eaves or in the upper angle of a window, to the annoyance of housekeepers who prefer the cleanness of their windows to the lively twitter of the birds, and the opportunity of watching their process of nest-building and their care of their young. House-martins congregate in great numbers, as chimney swallows also do before their autumnal migration, and disappear all at once. The house-martin is among the birds of Lapland and Iceland. The only other common British species of swallow is the SAND-MARTIN (*H. riparia*), smaller than either of the preceding, the toes naked, the tail moderately forked, the plumage brown on the upper parts and across the breast, the under parts white. It makes its nest on sandy river-banks, the sides of sand-pits, and other such situations, excavating a gallery of 18 in. or 2 ft., sometimes 3 or even 5 ft. in length, and more or less tortuous, in the extremity of which some soft material is placed for the reception of the eggs. This wonderful excavation is accomplished entirely by the bill of the bird. The floor slopes a little upward from the entrance, so that the lodgment of rain is prevented. The sand-martin is more local than the other British swallows; but it is distributed over most parts of Europe, Asia, Africa, and North America.—The PURPLE SWALLOW, or PURPLE MARTIN (*H. purpurea*), is a North American species, which has in a few instances been known to visit the British islands. The general color, both of the upper and under parts, is shining purplish blue; the wings and tail black. It abounds in North America, and is a universal favorite in the northern parts, being hailed as the harbinger of spring, and frequenting even the streets of towns. It is a very general practice to place boxes near houses for the martins to make their nests in, which are very inartificial, consisting merely of dried grass, leaves, moss, feathers, and the like. Boxes nailed to trees are also readily occupied by the RUFOUS-BELLIED SWALLOW (*H. erythrogaster*), another North American species. But this species, which very nearly resembles the chimney swallow of Britain, makes a nest of mud and fine hay, in the form of the half of an inverted cone, with an extension at the top for one of the parent birds to sit in occasionally. The REPUBLICAN SWALLOW, or CLIFF SWALLOW (*H. fulva*), of North America, makes a nest of mud, in form somewhat like a Florence flask, which it attaches to a rock or to the wall of a house. Hundreds sometimes build their nests in close proximity. The FAIRY MARTIN (*H. ariel*), a small Australian species, also builds a flask-shaped nest, with the mouth below, attaching it to a rock, or to the wall of a house, and numerous nests are often built close together.—Some of the swallows of tropical countries are much smaller than any of the European species.—The East Indian

swallows which make the edible nests (q.v.), belong to the section of the family to which the name swift is given. See *illus., LARKS, ETC., vol. VIII., figs. 13, 14.*

SWALLOWING. THE ACT OF, is accomplished by a set of associated movements which have been divided by physiologists into three stages. In the first stage, the food having been previously duly reduced to a pulp by trituration and insalivation, is carried back by the contraction of various muscles until it has passed the anterior palatine arch. See **PALATE.** So far, the movements are purely voluntary. The second stage now commences, during which the entrance of food into the nasal cavities and larynx is most carefully guarded against by certain reflex (involuntary) actions, which have been only clearly recognized since the introduction of the use of the laryngoscope during the last few years. The tongue is carried further backward, the larynx rises so as to be covered by the epiglottis, which is depressed and lies horizontally, so that its upper border touches the posterior wall of the pharynx. Coincident with these movements, the sides of the posterior palatine arch contract by muscular action, and approach each other like a pair of curtains, so as almost to close the passages from the fauces into the posterior nostrils; the closure being completed by the uvula. A sort of inclined plane is thus formed, and the morsel slips downward and backward into the pharynx, which is raised to receive it. Very little, if any, voluntary action is here exerted. The third stage—the propulsion of the food down the œsophagus—then commences, and this process is effected in the upper part by means of the constrictor muscles of the pharynx, and in the lower, by the muscular coat of the œsophagus itself. At the point where the latter enters the stomach, there is a sort of a sphincter muscle which is usually closed, but which opens when sufficient pressure is made on it by accumulated food, closing again when this has passed. See Carpenter's *Principles of Human Physiology.*

SWALLOW-WORT. See **ASCLEPIAS.**

SWAMMERDAM, JAN, a distinguished naturalist, was b. at Amsterdam, Feb. 12, 1637. Swammerdam, almost from his boyhood, showed the greatest eagerness in the study of natural history. Having entered upon the study of medicine, he particularly occupied himself with anatomy, and continued unremittingly to collect insects, to investigate their metamorphoses and habits, and, by the aid of the microscope, to examine their anatomic structure. He took his degree of doctor of physic at Leyden in 1667, and entered upon the practice of his profession, which his bad health, however, soon compelled him to relinquish. He continued to be chiefly engrossed with anatomy and entomology. His treatise on bees appeared in 1673; a treatise on ephemera in 1675. It is impossible, however, for us to enumerate his many publications, all of which were first published in Dutch, and afterward translated into Latin, and many of them into English, French, and German. Swammerdam's discoveries were very numerous, both in human and comparative anatomy. His skill in using the microscope was very great, and his manipulation of the most minute subjects extremely dexterous. He succeeded in giving distinctness to the forms of very minute viscera, by inflating them with air; a method of his own invention. It is melancholy to add, that Swammerdam, who had always displayed strong religious feelings, and expressed them in his writings, was at last carried away by the fanatical extravagances of Antoinette Bourignon (q.v.), began to think all his former pursuits sinful, and relinquished them for a visionary religious life of mere meditation and devotion. His health rapidly declined, and he died at Amsterdam, Feb. 17, 1680. No man of his time contributed more than Swammerdam to the progress of natural history and physiology. He was the inventor of the method of making anatomical preparations by injecting the blood-vessels with wax, and also of the method of making dry preparations of the hollow organs, now generally employed.

SWAMP ANGEL. An eight-inch rifled Parrott gun used by the Federals in the attack upon Fort Wagner during the civil war. It was named the "Swamp Angel" by the soldiers because it stood midway between Morris and James Islands in an immense marsh of soft black mud sixteen to eighteen feet deep. It was mounted upon a platform of logs raised on piles and was protected by a sand bag parapet and epaulement.

SWAN, *Cygnus*, a genus of birds of the duck (q.v.) family (*anatidæ*), constituting a very distinct section of the family. They have a bill about as long as the head, of equal breadth throughout, higher than wide at the base, with a soft cere, the nostrils placed about the middle; the neck very long, arched, and with 23 vertebra; the front toes fully webbed, the hind toe without membrane; the keel of the breast-bone very large; the intestines very long, and with very long cæca. They feed chiefly on vegetable substances, as the seeds and roots of aquatic plants, but also on fish-spawn, of which they are great destroyers. They are the largest of the *anatidæ*. They have a hissing note like geese, which they emit when offended, and strike with their wings in attack or defense. The common notion, that a stroke of a swan's wing is sufficient to break a man's leg, is exaggerated. The COMMON SWAN, MUTE SWAN, or TAME SWAN (*C. olor*), is about 5 ft. in entire length, and weighs about 30 lbs. It is known to live for at least 50 years. The male is larger than the female. The adults of both sexes are pure white, with a reddish bill; the young (cygnets) have a dark bluish-gray plumage, and lead-colored bill. The bill is surmounted by a black knob at the base of the upper mandible, and has a black nail at its tip. In its wild state, this species is found in the eastern parts of Europe and in Asia; in a half-domesticated state it has long been a common orna-

ment of ponds, lakes, and rivers in all parts of Europe. It is an extremely beautiful bird when seen swimming, with wings partially elevated, as if to catch the wind, and finely curving neck. The ancients called the swan the bird of Apollo or of Orpheus, and ascribed to it remarkable musical powers, which it was supposed to exercise particularly when its death approached. It has, in reality, a soft low voice, plaintive, and with little variety, which is to be heard chiefly when it is moving about with its young. The nest of the swan is a large mass of reeds and rushes, near the edge of the water, an islet being generally preferred. From 5 to 7 large eggs are laid, of a dull greenish-white color. The female swan sometimes swims about with the unfledged young on her back, and the young continue with their parents until the next spring. The swan is now seldom used in Britain as an article of food, but in former times it was served up at every great feast, and old books are very particular in directions how to roast it and to prepare proper gravy.—The POLISH SWAN (*C. immutabilis*), of which flocks have occasionally been seen in Britain in winter, differs from the common swan in its orange-colored bill, in the smaller tubercle at its base, and in the shape and position of the nostrils. The young are also white, like the adults. It belongs chiefly to the north-eastern parts of Europe. Many naturalists regard it as the true wild state of the common swan.—The WHISTLING SWAN, ELK SWAN, or HOOPER (*C. ferus*), abounds in the northern parts of Europe and Asia. Flocks frequently visit Britain in severe winters, and their migrations extend as far s. as Barbary. A few breed in the Orkney islands, but the greater number in more northern regions. The size is about equal to that of the common swan, and the color is similar, but the bill is more slender, is destitute of knob, and is black at the tip, and yellow at the base. This bird is frequently brought to the London market. The names hooper and whistling swan are derived from the voice. The anatomical differences between this species and the common swan are more considerable than the external, particularly in the double keel of the breast-bone forming a cavity which receives a long curvature of the wind-pipe.—BEWICK'S SWAN (*C. Bewickii*), another native of northern Europe, is more rare in Britain, but flocks are sometimes seen. It is about one-third smaller than the whistling swan.—The AMERICAN SWAN (*C. Americanus*) nearly resembles Bewick's swan. It breeds in the northern parts of North America, and its winter migrations only extend to North Carolina.—The TRUMPETER SWAN (*C. buccinator*) is another American species, breeding chiefly within the Arctic circle, but of which large flocks may be seen in winter as far s. as Texas. It is rather smaller than the common swan.—The ancients spoke of a black swan proverbially as a thing of which the existence was not to be supposed, but Australia produces a BLACK SWAN (*C. atratus*), rather smaller than the common swan, the plumage deep black, except the primaries of the wings, which are white. The bill is blood-red. It has been introduced into Britain, and breeds freely. It is very abundant in some parts of Australia.—The BLACK-NECKED SWAN (*C. nigricollis*) is a South American species, as is the DUCK-BILLED SWAN (*C. anatoides*), the smallest of all the species, white, with black-tipped primaries, common about the strait of Magellan. It is a curious circumstance that the black color appears more or less in all the species of the southern hemisphere, and in them alone, except in the approach to it made in cygnets.

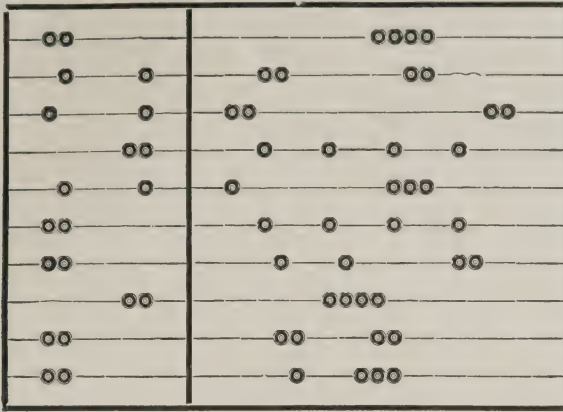
Swans, according to the law of England, are birds royal. When they are found in a partially wild state, on the sea and navigable rivers, they are presumed to belong to the crown, and this is one of the prerogatives of the crown, though it may be delegated to a subject. The royal birds generally have a mark on them, and the king's swan-herd once was an important person. A subject is not entitled to have a swan-mark unless he has a qualification of land, and has a grant from the crown, or prescriptive use.

SWAN, JAMES, 1754-1831; born Scotland; came to this country when a boy and engaged in business in Boston. He took part in the popular agitation leading to the revolution, was one of the Boston "tea party," and aide to Warren at Bunker Hill. He afterward served as member of the Massachusetts legislature and adjt. gen. of the state. After the war he made a large fortune in Paris, and, 1795-98, visited this country and spent money profusely. In 1815, then being in Europe, he was arrested on a civil suit, and, refusing to settle, lived for 15 years in Ste. Pelagie prison, Paris, in the most magnificent style. He published a number of pamphlets on such subjects as the slave trade (1772), fisheries, the commerce of France and the United States, agriculture, and manufactures.

SWANN, THOMAS, b. Va. in 1805; educated at the university of Virginia; afterwards studied law at Washington, and in 1834 settled in Baltimore, where the greater part of his life was spent. He was president of the Baltimore and Ohio railroad, 1847-53, and was connected with other railroads. In 1858 he was elected mayor of Baltimore. He warmly supported the union during the civil war, and in 1864 was chosen governor of the state. In 1868 he was elected to congress and served ten years. He d. 1883.

SWAN-PAN. (Shwan-Pan). The Chinese Abacus. It consists of an oblong frame holding 10 parallel wires. These wires are unequally divided, with four beads in the longer, and two in the shorter portions of the instrument, and embraces numbers as far as *ten billions*. In representing numbers upon it, the *swan-pan* is held in a vertical position, thus bringing the wires into horizontal lines. The values of the beads increase in descending, the greater numbers being placed underneath the smaller. As the decimal

system applies to the Chinese coins, and to all their measures of weight, length, and capacity, the *swan-pan* is adapted to arithmetical operations of every kind.



SWAN'SEA (Welsh, *Abertawy*), a market t., municipal and parliamentary borough, and sea-port of the county of Glamorgan, South Wales, stands on the right bank and at the mouth of the Tawe, 60 m. w.n.w. of Bristol. The harbor is formed by means of piers of masonry projecting from either side of the mouth of the Tawe into Swansea bay, a wide inlet of the Bristol channel. The vast resources of the coal-field in the midst of which the town is situated began to be explored and turned to commercial account about the year 1830; and since that time the progress of Swansea has been so rapid that it is now the most important town in South Wales. The houses and public edifices and institutions are of recent erection. A good public hall was erected in 1864, and a spacious and well arranged infirmary in 1867. Swansea is the chief seat of the tinplate trade of England, and probably the most important copper smelting and refining center in the world. No copper is found in this part of Wales, but the coal obtained in the vicinity is peculiarly adapted for smelting purposes, and great quantities of ore are brought hither to be smelted, not only from the copper-mines of Britain, but from Cuba and the west coast of South America. In the immediate vicinity of the town, there are smelting-works, in which many thousands of tons of copper, copper ores, silver ores, and zinc ores are smelted annually. Of the whole amount of copper manufactured in Great Britain, seven-eighths are smelted at Swansea and in its immediate vicinity. In 1859, a large floating dock, 13 acres in extent, was opened by the side of the harbor. Its north side is lined with warehouses. In 1881 a new dock was finished at a cost of \$1,500,000. Pop. '91, 90,349.

SWARGA is the paradise of the Hindu god, Indra (q.v.). It is the residence of some of the inferior gods and deified mortals, who there rest in the shade of the five wonderful trees—*Mandâra*, *Pârjâtâ*, *Santâna*, *Kalpavriksha*, and *Harichandana*, drink *Amrita*, or the beverage of immortality; and enjoy the music of the *Gandharvas*, and the dancing of the heavenly nymphs, the *Apsarasas*.

SWARMING, a peculiar mode of reproduction which has been observed in some of the *confervaceæ*, *desmidiæ*, etc. The granules which form the green matter in the plant, or in one of its joints, become detached from each other, and move about in the cell with great rapidity. The external membrane swells in one point and finally bursts there, when the granules escape into the surrounding water to become new plants. At first they issue in great numbers, but those which remain last move about within their cell for a long time before they find the way out. Their motion is supposed to be due to cilia.

SWAYNE, WAGER, b. Columbus, Ohio, 1834; son of Judge Noah H.; graduate of Yale college, 1856; studied law and commenced practice in his native town. In the civil war he was major 43d Ohio infantry, 1862; raised to colonel after effective service at Iuka and Corinth. He served through the Georgia campaign, lost a leg at Salka-hatchie, where he greatly distinguished himself, and was made maj.gen., 1863, and assigned to the commission on refugees, freedmen, and abandoned lands. He was commissioned col. 45th infantry, 1866; retired, 1870.

SWE'ABORG, or SVE'ABORG, a great Russian fortress in the principality of Finland, and government of Viborg, sometimes called "the Gibraltar of the north," protects the harbor and town of Helsingfors, from which it is only 2 m. distant. The fortifications extend over seven islands, the *Nylandischen Skären*, but the grand central point is the island of Vargö. The islands are connected with each other by means of bridges, and between two of them lies the single narrow entrance to the harbor, which can hold from 70 to 80 ships of the line. Swe'aborg has a civic pop. of about 3,000, the greater part of whom are manual-laborers, ship-carpenters, and traders, and a garrison of some 5,000 men (including women and children). During the Crimean war the Anglo-French fleet

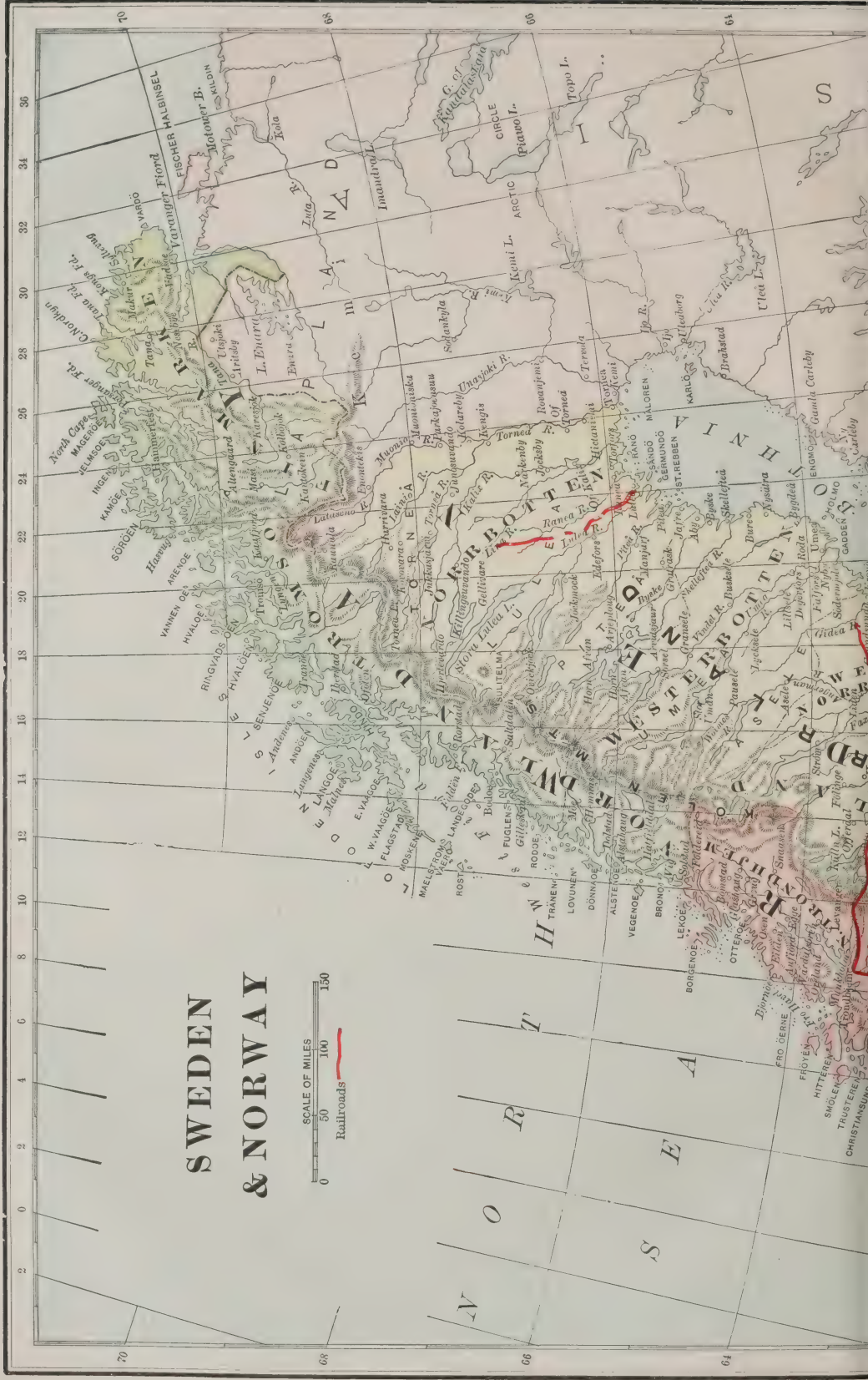
in the Baltic made a reconnoissance of the place, and bombarded it for two days (Aug. 9 and 10, 1855), but found the defenses too formidable to be reduced,

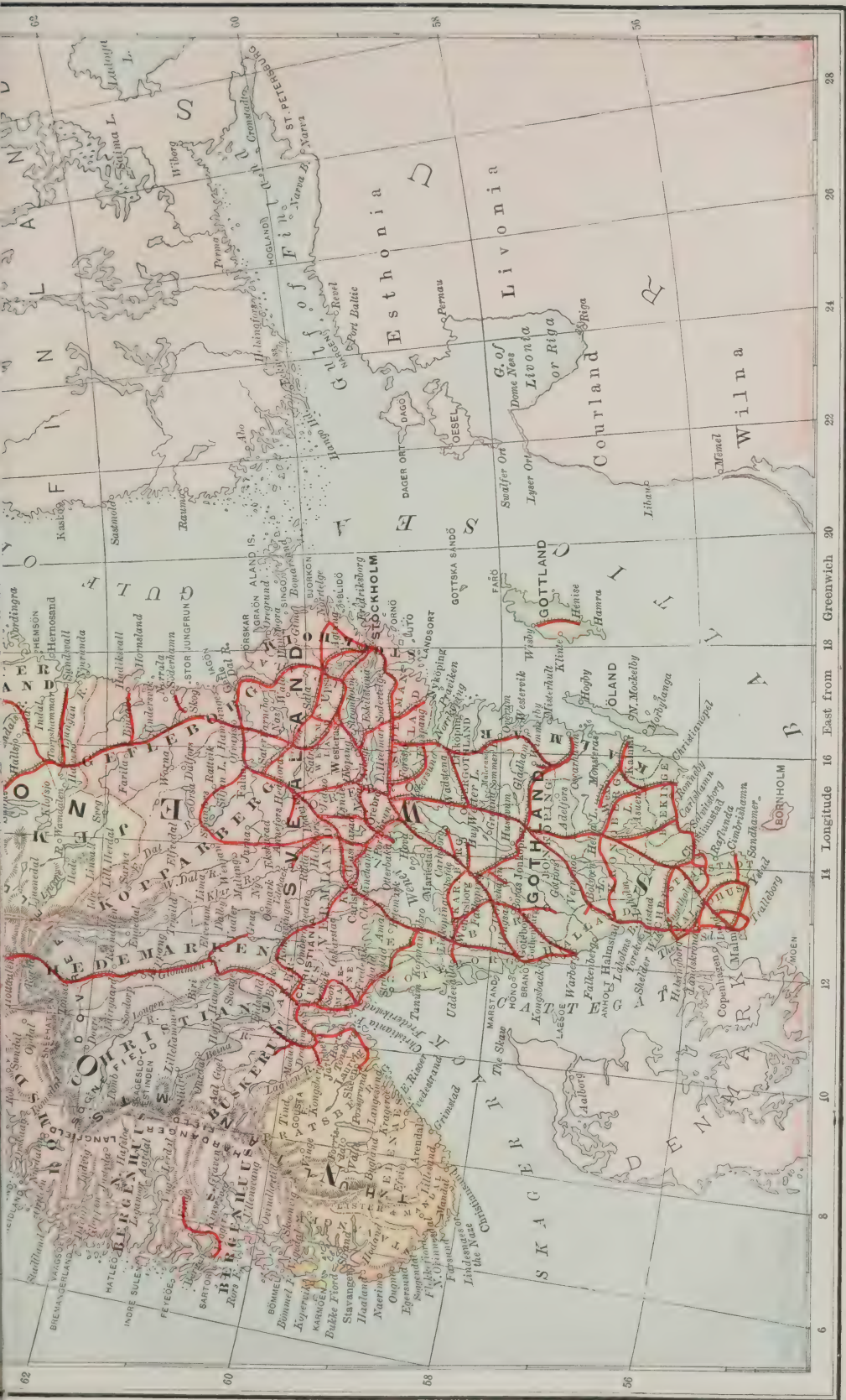
SWEARING, PROFANE, according to the law of England, is an offense for which the party may be convicted by a justice of the peace according to a scale of penalties. A day laborer, common soldier, sailor, or seaman forfeits 1s per oath; every other person under the degree of a gentleman, 2s; and every person above the degree of a gentleman, 5s—for a second offense double these sums; for a third treble, etc. If the cursing take place in the presence of a justice of the peace, the latter may convict the prisoner then and there, without further process. Laws against profane swearing were general in the colonies of America, and in many instances were enforced with great severity. Similar laws remain on the statute books of almost all the states, but the enforcement of these laws is rare. These laws, however, never made, as did the Eng. laws on this point, any distinction as to classes. There were, however, in some of the New England states distinctions made in the punishment for different forms of profane swearing.

SWEAT (A. S. *swat*, Sansc. *svaidas*, Lat. *sudor*; Gr. *hydor*, moisture; Lat. *ud(us)* = wet), or perspiration. The nature, composition, and uses of this fluid in the normal state have been sufficiently noticed in the article **SKIN**. It may be additionally remarked, in connection with the physiology of sweat, that the composition of this fluid varies materially according to the part of the body from which it is secreted. Thus Funk found the sweat of the feet was richer in fixed salts than that of the arm, in the ratio of 5 to 3; and Schotten found a considerable preponderance of potassium in the former. In the negro, Dr. Copland and other observers have found that both the gaseous exhalations from the skin, and the solid matters contained in the sweat, were much greater than in the white races. It has been shown in the article **SKIN** that the sweat-glands, like the lungs and kidneys, act as depurating organs, and separate and carry off effete matters from the blood. This eliminative action of the skin is modified in various diseases; in some cases being diminished, as in the early stage of fevers, in inflammations before suppuration commences, in scurvy, diabetes, sunstroke, etc., while it is more or less increased in the sweating stage of ague, in acute rheumatism, in Asiatic cholera, in certain adynamic fevers, in the advanced stages of pulmonary consumption, in the formation of matter in internal parts, etc. The sweat is naturally acid in health, but in prolonged sweating the secretion becomes neutral, and finally alkaline. Little is known with certainty regarding the coloring matters of sweat. In cases of jaundice, the sweat sometimes communicates a yellow tinge to the body-linen; and instances of blue, red, and bloody sweat are on record. Cases of sweat of these colors are recorded in Simon's *Animal Chemistry* (Syd. Soc. Trans., (London, 1845), vol. ii., p. 110. Cases of unilateral sweating, stopping abruptly at the middle line, have been occasionally noticed, especially in aneurism of the aorta.—See Gairdner's *Clinical Medicine*, page 557. Dr. Drutt has pointed out the use of hot water as a remedy for profuse perspiration. He has found it serviceable in (1) oversweating in good health and hot weather; (2) undue sweating in special parts of the body, as the hands, feet, or armpits; (3) true hectic; and (4) ordinary night sweats in phthisis not preceded by hectic symptoms. To be of any service, the water must be applied at as great a heat as the patient can possibly bear (see his paper on this subject in the *Medical Times* for March 4, 1865). For a very interesting and learned discussion on our Saviour's bloody sweat during his passion, the reader may consult Stroud *On the Physical Cause of the Death of Christ*, and Trusen's chapter *Von dem Blutschweisse Christ* in his *Darstellung der Biblischen Krankheiten*, 1843.

SWEATING SICKNESS, **THE**, is the term given to an extremely fatal epidemical disorder, which ravaged Europe, and especially England, in the 15th and 16th centuries. It derives its name "because it did most stand in sweating from the beginning until the endyng," and "because it first beganne in Englande, it was named in other countries the Englishe sweat."—*The Boke of Thon Caius against the Sweating Sicknes*. It first appeared in August, 1485, in the army of Henry VII., shortly after his arrival at Milford in South Wales from France, and in a few weeks it spread to the metropolis. It was a violent inflammatory fever, which, after a short rigor, prostrated the powers as with a blow; and amid painful oppression at the stomach, headache, and lethargic stupor, suffused the whole body with a fetid perspiration. All this took place in the course of a few hours, and the crisis was always over within the space of a day and night. The internal heat which the patient suffered was intolerable, yet every refrigerant was certain death. "*Scarce one amongst a hundred that sickened did escape with life.*"—Holinshed, vol. iii. p. 482. Two lord mayors of London and six aldermen died within one week; and the disease for the most part seized as its victims robust and vigorous men. It lasted in London from the 21st (some authorities say the middle) of September to the end of October, during which short period "many thousands" died from it. The physicians could do little or nothing to combat the disease, which at length was swept away from England by (as many supposed) a violent tempest on New Year's day. The disease did not re-appear till the summer of 1506, when it broke out in London, but does not seem to have occasioned any great mortality. In July, 1517, it again broke out in London in a most virulent form; it being so rapid in its course that it carried off those who were attacked in two or three hours. Among the lower classes, the deaths were innumerable, and the ranks of the higher classes were thinned. In many towns a third, or even a half of the inhabitants were swept away. On this occasion, the epidemic lasted about six months. In May, 1528—the year in which the French army before Naples was de-

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stroyed by pestilence, and in which the putrid fever known as *Trousse-galant* decimated the youth in France—the sweating sickness again broke out in the metropolis, spread rapidly over the whole kingdom, “and fourteen months later, brought a scene of horror upon all the nations of northern Europe scarcely equaled in any other epidemic.”—Hecker's *Epidemics of the Middle Ages*, (Syd. Soc. Trans.), p. 238. How many lives were lost in this epidemic, which has been called by some historians the *great mortality*, is unknown; but the mere fact that the king (Henry VIII., who, whatever his faults, was never accused of cowardice) left London, and endeavored to avoid the disease by continually traveling, shows the general feeling of alarm that existed. In the following summer (July 25, 1529), having apparently died out in England, it appeared in Germany, first at Hamburg, where it is recorded that 8000 persons died of it, and shortly after at Lubeck, Stettin, Augsburg, Cologne, Strasburg, Hanover, etc. In September, it broke out in the Netherlands, Denmark, Sweden, and Norway, whence it penetrated into Lithuania, Poland, and Livonia. By January of the following year, after an existence of three months, it had entirely disappeared from all these countries. For three-and-twenty years the sweating sickness totally disappeared, when for the last time (April 15, 1551) it burst forth in Shrewsbury. The banks of the Severn seemed to be the focus of the malady, which was carried from place to place by poisonous clouds of mist. There died within a few days 960 of the inhabitants of Shrewsbury, the greater part of them robust men and heads of families. The disease spread rapidly over the whole of England, but seems to have disappeared by the end of September. The deaths were so numerous, that one historian (Stow) states that the disorder caused a *depopulation* of the kingdom. The very remarkable observation was made in this year, that the sweating sickness uniformly spared foreigners in England, and on the other hand, followed the English into foreign countries. The immoderate use of beer among the English was considered by many as the principal reason why the sweating sickness was confined to them. “By the autumn of 1551,” says Hecker, “the sweating sickness had vanished from the earth; it has never since appeared as it did then and at earlier periods; and it is not to be supposed that it will ever again break forth as a great epidemic in the same form, and limited to a four-and-twenty hours' course; for it is manifest that the mode of living of the people had a great share in its origin, and this will never again be the same as in those days.”—*Epidemics of the Middle Ages* (Syd. Soc. Trans.), p. 306.

SWEDEN, *Sverige*, the eastern portion of the Scandinavian peninsula, governed with Norway by a single King. It is situated in 55° 20'–69° 3' n. lat., and 11°–24° e. long., and is bounded on the n. and w. by Norway; on the extreme s.w. and s. by the Cattegat, which separates it from Denmark; on the s.e. and e., as far as 66° n. lat., by the Baltic and the gulf of Bothnia; and from thence to the extreme n. by Russia. The area is 172,876 sq. m.; and the population was estimated, Dec. 31, 1895, at 4,919,260. Its length is 969 m., and its greatest width from 150 to 280 miles. Sweden is divided into three provinces—viz., Norrland, the largest and most northern; Sweden Proper, or *Svea-rike* (land of the Swedes), in the center; and Götland, or *Göta-rike* (land of the Goths), to the south. The following are the areas and populations of the 25 län into which the provinces are subdivided:

| Län. | Area: Eng. Sq. Miles. | Population, Dec. 31, 1890. | Population, Dec. 31, 1895. |
|---------------------------------|--------------------------|-------------------------------|-------------------------------|
| Stockholm (rural district)..... | 3,015 | 152,715 | 157,457 |
| Upsala..... | 2,051 | 121,091 | 123,015 |
| Södermanland..... | 2,631 | 154,991 | 161,722 |
| Östergötland..... | 4,267 | 266,619 | 270,973 |
| Jönköping..... | 4,447 | 193,704 | 195,856 |
| Kronoberg..... | 3,825 | 160,835 | 158,838 |
| Kalmar..... | 4,443 | 232,847 | 229,176 |
| Götland..... | 1,219 | 51,337 | 51,855 |
| Blekinge..... | 1,164 | 142,602 | 143,387 |
| Kristianstad..... | 2,486 | 221,691 | 219,858 |
| Malmöhus..... | 1,866 | 368,817 | 383,203 |
| Halland..... | 1,900 | 136,106 | 139,356 |
| Göteborg and Bohus..... | 1,948 | 297,824 | 313,340 |
| Elfsborg..... | 4,938 | 275,780 | 274,698 |
| Skaraborg..... | 3,280 | 247,074 | 244,514 |
| Värmland..... | 7,435 | 253,326 | 252,915 |
| Örebro..... | 3,498 | 182,557 | 188,771 |
| Vestmanland..... | 2,625 | 137,453 | 142,735 |
| Kopparberg..... | 11,522 | 197,449 | 206,774 |
| Gefleborg..... | 7,614 | 206,924 | 218,864 |
| Västernorrland..... | 9,837 | 208,763 | 217,220 |
| Jemtland..... | 19,712 | 100,455 | 104,259 |
| Vesterbotten..... | 22,754 | 122,784 | 133,336 |
| Norrbottn..... | 40,870 | 104,783 | 115,500 |
| Lakes Venern, Vättern, etc..... | 3,516 | ..... | ..... |
| Total..... | 172,863 | 4,538,527 | 4,647,622 |
| City of Stockholm..... | 13 | 246,454 | 271,638 |
| Total..... | 172,876 | 4,784,981 | 4,919,260 |

In 1878 Sweden ceded her only colony, St. Bartholomew, to France (to which country it once belonged) on payment of the purchase-money agreed on. See BARTHOLOMEW, St.

Unlike Norway, Sweden possesses few high mountains, but contains numerous lakes of large dimensions. The coast skirting the Baltic, and the adjoining islands, are for the most part low and sandy, although in some parts, as in the vicinity of the outlet of lake Maelar into the sea (in about 58° n. lat.), the shores are steep; and on the s. and w. coast, the generally low, alluvial lands are replaced by more rocky formations.

In the northern parts the land rises gradually from the gulf of Bothnia to the Kjölen range, belonging to the great Norwegian Fjeldmark, which constitutes the true watershed and natural boundary between Sweden and Norway. South of 62° n. lat., the slope is directed southward, attaining its lowest level in the vicinity of the three great lakes of Wener, Maelar, and Hjelmar, which, together with the great Wetter Lake, nearly intersect the country from e. to w.; and s. of these great inland waters, the surface is in general level, though ranges of high ground and detached hills occur.

Sweden may be considered to be divided into three distinct parts—viz., the northern or alpine region, the central or lake district, and the southern or mining district. The extreme s. includes the only level and fertile tract, in which wheat can at all times be advantageously and extensively cultivated. The lakes of Sweden have been computed to cover nearly $\frac{1}{4}$ th of the entire area of the country. The largest are Lake Wener (q.v.), Lake Wetter (q.v.), and the Maelar Lake (q.v.). The rivers are generally short and rapid, and only made navigable by art. The largest is the Angermann Elv, which flows into the gulf of Bothnia. The Cattogat is connected with the Baltic by means of an admirable system of canals, etc.

Natural Products, etc.—The heat of the summer, which is scarcely separated from the cold of the winter by either spring or autumn in the extreme northern districts, enables the inhabitants to cultivate barley, which is reaped within two months of the time of its sowing, although even the hardier cereals, as oats and rye, will not ripen above the parallel of 66° n. lat. Indeed, the climate of Sweden generally is unfavorable to the growth of grain, the annual yield of which frequently falls short of the wants of the population. The principal articles of cultivation are, in addition to the various cereals, potatoes, hemp, flax, tobacco, and hops, which are generally grown in sufficient quantities for home consumption. The forests are of great extent, covering nearly one-fourth of the entire surface, and rising at some spots to an elevation of 3000 ft. above the level of the sea. The birch, fir, pine, and beech are of great importance, not only for the timber, tar, and pitch which they yield, but also from their supplying charcoal and firewood. Above the parallel of 64°, stunted bushes, berries, dwarf-plants, and lichens are the only forms of vegetation to be met with. The common fruit-trees, as cherries, apples, and pears, grow as far north as 60°, but the fruit seldom comes to great perfection except in the southern provinces; cranberries and other berries abound, however, in all parts of the country. Bears and beavers, which were formerly often met with, are becoming scarce; but wolves, lynxes, foxes, martens, squirrels, eagles, reindeer, in the Lappmarks, etc., are still common; while the elk and deer are found in some of the forests, which abound in hares, woodcock, blackcock, and various other kinds of small game; and lemmings (q. v.) occasionally descend from the mountains in large numbers, and lay waste the low country. The waters along the coast yield a great abundance of fish, many different kinds of sea and fresh-water fish being brought to market. The mineral products of Sweden, which are extremely rich, include some gold and silver (which, however, do not pay the cost of working), copper in abundance, iron of the finest quality, alum, vitriol, marble, sulphur, lead, plumbago, cobalt, nickel, zinc, and some coal.

Industries.—In almost all branches of production there was a remarkable increase between the year 1866 and 1896. In respect to agriculture, the principal occupation of the inhabitants, the cultivated area in 1866 was 2,500,000 hectares (a hectare being equal to 2.471 acres), while in 1896 it was 3,500,000 hectares. In the associated industry of dairy farming there has been an equally great increase, and this branch of production has become one of the most important in Sweden. To illustrate its increase, while Sweden at the beginning of this period was an importer of butter to the extent of over 11,000,000 pounds a year, at the end of it she was an exporter to the extent of over 55,000,000 pounds. Not only did the number of live stock increase during this period of thirty years, but the quality of the breeds was greatly improved. The output of pig-iron doubled during the same interval and that of iron ore quadrupled. A still more remarkable advance was that of the steel industry, which, during the decade 1860–70, produced only 7,000 tons a year, while in 1896 the output was 170,000 tons. The number of employees engaged in industries was more than three times as great at the end of the period as at the beginning, and foundries and mechanical works, sugar works and refineries, paper mills, etc., all showed a considerable increase in the value of their output. The timber trade affords employment to large numbers of the inhabitants, and is one of the most important of Swedish industries. Its advance has kept pace with the improvement in other trades. The tonnage of sailing-vessels in the mercantile navy has increased, but not to the same extent as that of the steamships, whose tonnage in 1896 was more than twelve times as great as in 1866. The building of railroads has also

greatly advanced, the mileage for 1866 being 932, and for 1896, 6214. Considering the smallness of her population, this mileage is very considerable for Sweden. In 1896 preparations were made for an exhibition to be held at Stockholm in the spring of the following year. This was the fourth international exhibition held in Scandinavia, the first having taken place also at Stockholm in 1866. The countries participating in the exposition of 1897 were Sweden, Norway, Denmark, Finland and Russia, and nearly all European countries planned to contribute to the art exhibition.

Exports and Imports.—Of agricultural products Sweden exports only a small quantity of grain, with the exception of oats, the exports of which have been considerable. For wheat, rye, barley, wheat flour and rye flour, she has been largely dependent upon foreign countries. According to the report for the year ending Sept. 30, 1896, she exported a considerable number of neat cattle, sheep and hogs, and her exports of pork considerably exceeded her imports. The importation of butter is very large and has increased in value from over \$5,000,000 in 1886-87 to over \$12,000,000 in 1895-96. In 1896 the statistics placed Sweden at the head of all the wood-exporting countries in the world. The chief articles of import from the United States to Sweden are wheat, maize, wheat flour, leather, cotton, petroleum, machinery, pork, syrup, and molasses. In respect to petroleum, the United States has had a formidable competitor in Russia, and the development of American trade has been retarded by the lack of trade steamship communication.

Gold is fixed by law as the metallic standard of Sweden, and it forms the basis of the coinage system. Formerly Sweden had a silver standard, the chief coin or unit being equivalent to about four kronor of the present coin, but by the law of May 30th, 1873, the gold standard was adopted, from fear of a constant tendency on the part of silver to depreciate. Nominal wages are much lower than in the United States; the average wages for men, according to the agricultural society's report on the rates among farm laborers in 1894, was \$109.34, or 408 kronor. The value of the krona or crown in United States money, according to the official report of the United States treasury in 1897, was 26.8 cents.

Revenue, etc.—Sweden levies a tax on imports, and this supplies the chief source of revenue. According to the budget estimate for 1897, the national income from the customs was one-third of the total revenue. Next in importance was the impost on spirits, etc., and a large return came from the public domains, railways, and the tax on land. About one-third of the railways belong to the state. The debt of Sweden amounted in 1896 to 287,505,967 kronor, all of which was incurred to meet the expense of building and carrying on the railways. The receipts from the railways amounted to about two-thirds of the interest on this debt. For an account of the army and navy of Sweden, see the articles NAVIES, MODERN and ARMIES, MODERN.

Form of Government.—Sweden is a hereditary and constitutional monarchy, based on the fundamental law of 1809, by which it was decreed that the succession should be in the male line; that the sovereign should profess the Lutheran faith; and have sworn fidelity to the laws. The diet, which meets every year, and remains sitting for three or four months, is composed of two chambers, which are both elected by the people. The first chamber consists of 150 members, who receive no payment, and are elected for nine years, their number being, however, dependent upon that of the population. They must be possessed of an income of about £223, and have attained the age of 35. The second chamber is composed of 230 members, elected for three years, on a lower scale of qualification as to property and age; and receiving payment for their attendance during each session of the diet, and for their traveling expenses. Election to both chambers is by ballot. The diet exercises a strict control over the expenditure of the revenue, fixes the budget, and has power to take cognizance of the acts of the ministers and crown officers. The king's person is inviolable, and he can exercise a veto on the decrees of the diet. He is the supreme head of the law courts, nominates to all appointments, can declare war, make peace, and conclude foreign treaties. He is assisted by a council of state composed of 10 members, who are responsible to the diet.

Law, etc.—The administration of the law is independent of the state, and presided over by the chancellor of justice, *justitie kansler*, appointed by the king, and an attorney-general, *justitie ombudsman*, appointed by the diet.

Sweden is divided administratively into 25 *läns*, presided over by chief magistrates, and subdivided into 117 *fögderin*, and 520 *länsmans* districts. There are 90 chief towns (*städer*), only a limited number of which have the right of trading with foreign ports, and 19 market-towns (*Köpingar*). Besides Stockholm, the capital (*q. v.*), only two towns, Göteborg (114,527) and Malmö (52,470), had a pop. of more than 50,000 in 1895. Next in rank came Norrköping, with 36,075; Gefle, with 25,569; and Karlskrona, with 22,496 inhabitants. Upsala, a cathedral and university town, which is the most interesting spot in the kingdom, as the original seat both of Christianity and of the ancient Odinic faith, has a pop. of 21,428.

Religion, etc.—The state religion is Lutheran. The affairs of the church are administered by 1 archbishop (of Upsala) and 11 bishops. According to the census of 1890, there were 4,735,218 Evangelical Lutherans and 44,378 Protestant dissenters.

Education, etc.—Education is universally diffused among the Swedes by the agency of *fasta* (regular) and *flyttande* (ambulatory) schools in all the country districts. Public

instruction is compulsory for all children, and the cost is defrayed by the nation. Ample means are supplied for a higher form of instruction in the *läroverk* or gymnasia of the towns, and at the universities of Upsala and Lund. The Karolinska institute at Stockholm is the medical college of Sweden; and there are numerous technical, military, and other special collegiate institutions in the principal towns of the kingdom. The transactions of the two learned societies, the "*Svenska Vetenskaps Selskap*," and the "*Svenska akademie*," afford honorable testimony to the advanced condition of scientific inquiry in Sweden. There are well equipped libraries at Stockholm, Upsala, and Lund. That of Upsala is contained in a special building, *Carolina Rediviva*, to which is attached a botanical garden arranged on the Linnæan system.

History.—The legendary history of Sweden forms part of Scandinavian history. When we first hear of Sweden the country was inhabited by numerous tribes, kindred in origin but politically separate. Two principal groups, however, are recognizable—*Goths* in the south and *Svedes* in the north. These possessed in common a national sanctuary, the temple of Upsala, which laid the basis of a later unification, for gradually the royal chieftains of Upsala extirpated the inferior princes, the *Härads* and the *Fylkis*. Ingiald Illrada, the last ruler of the old royal family of the Ynglingar, who drew their origin from Njord, sought to establish a single government in Sweden, and perished in the attempt. To the Ynglingar followed in Upland the dynasty of the *Skioldungar*, which claimed to be descended from Skjold, son of Odin. Erik Edmundsson, who belonged to this dynasty, is said to have acquired the sovereignty of the whole of Sweden about the end of the 9th century. The dawn of Swedish history (properly so called) now begins, and we find the Swedes constantly at war with their neighbors of Norway and Denmark, and busily engaged in piratical enterprises against the eastern shores of the Baltic. See NORMANS and RUSSIA. Efforts to introduce Christianity (see ANSGAR) were made as early as 829 A.D., but it was not till 1000 A.D. that Olof Skötkonung, the Lap-king, was baptized, nor did the struggle between heathenism and the new religion cease till the burning of the temple of Upsala in the reign of Inge (1080-1112). In 1155 Erik, surnamed The Saint, gave a powerful impetus to the diffusion of Christian doctrines by building churches and founding monasteries. He undertook a crusade against the pagan Finns, and, having compelled them to submit to baptism, and established Swedish settlements among them, he laid the foundation of the union of Finland with Sweden. Erik's defeat and murder in 1160 by the Danish prince Magnus Henriksen, who made an unprovoked attack upon the Swedish king, was the beginning of a long series of troubles, and during the following 200 years, one short and stormy reign was brought to a violent end by murder or civil war only to be succeeded by another equally short and disturbed. At length, in 1389, the throne was offered by the Swedish nobles to Margaret, queen of Denmark and Norway, who, having gladly availed herself of the opportunity thus opened to her of uniting the three Scandinavian crowns into one, threw an army into Sweden, defeated the Swedish king Albert of Mecklenburg, who on the deposition of his maternal uncle Magnus had been called to the vacant throne, and by the union of Calmar in 1397 brought Sweden under one joint scepter with Denmark and Norway. In 1523 Sweden emancipated itself from the union with Denmark, which during the reigns of Hans and his son Kristian II. (see DENMARK) had become hateful to the Swedes, and rewarded its deliverer, young Gustaf Vasa (see GUSTAVUS I.), by electing him king and declaring its independence of Denmark. Gustaf Vasa found an empty treasury, a kingdom exhausted by war, a haughty nobility and clergy (who arrogated the right of electing the sovereign, and who claimed exemption from all imposts), and a people overburdened with taxation and bad government and divided in regard to religion. On his death in 1560 he left to his successor a hereditary and well-organized kingdom (in which the power of the nobles had been circumscribed, and that of the clergy broken, by the abrogation of Catholicism and the firm establishment of the reformed church under the jurisdiction of the state), a full exchequer, a standing army, and a well-appointed navy. Trade, manufactures, art, learning, and science owed their advancement in Sweden to this patriotic king.

The colossal labors of the great Vasa in raising a semi-barbarous state to an honorable place among the civilized monarchies of Europe, were rendered almost useless by the crimes and misfortunes of his son and successor, Erik XIV., whose high intellectual powers were clouded by a wayward and revengeful nature, leading him finally to insanity. His cruelties and excesses led to his deposition in 1568, when his younger brother Johan ascended the throne, which he occupied for nearly a quarter of a century, dying in 1592, after a stormy reign, stained by the cruel murder of his unfortunate brother Erik, and distracted by the internal dissensions arising from his attempts to force Catholicism on the people, and to carry on war with the Danes, Poles, and Russians. Johan's son and successor, Sigismund, who had been elected king of Poland through the influence of the relatives of his Polish mother, after a short and stormy reign of eight years, which were spent in attempting to restore Catholicism in Sweden, was compelled by the diet to resign the throne in 1599 to his uncle Karl, the only one of Gustaf Vasa's sons who inherited any share of his legislative and administrative talents. The policy of Karl IX., was to encourage the burgher classes at the expense of the nobility; and by his successful efforts to foster trade—in furtherance of which he laid the foundation of

Göteborg and other trading ports—develop the mineral resources of the country, and reorganize the system of Swedish jurisprudence, he did much to retrieve the calamitous errors of his predecessors. The deposition of Sigismund gave rise to the Swedo-Polish war of succession, which continued from 1604 to 1660; and on the death of Karl in 1611, his son and successor, the great Gustavus Adolphus, found himself involved in hostilities with Russia, Poland, and Denmark. By the ability of his minister, Oxenstierna, the young king was soon enabled to conclude treaties of peace with his northern neighbors, and to place the internal affairs of his kingdom in order (see GUSTAVUS II.); and although he justly ranks as one of the greatest military commanders of his age, the extraordinary number of benefits which he conferred on every department of the administrative system of Sweden, entitle him to still greater renown as the benefactor of his native country. His death in 1632, on the field of Lützen, would have proved an irreparable calamity to Sweden, had not the able administration of Oxenstierna, during the minority of Gustavus's daughter, Christina, maintained the renown of the Swedish arms abroad, and the political reputation of the country among other states. The reign of Christina (q.v.) was disastrous in every act but that of her abdication. The short reign of Karl X. was occupied in generally unsuccessful wars against Poland and Denmark; while the minority and long rule of his son, Karl XI.—from 1660 to 1697—was characterized by success abroad, and in the augmentation of the regal power, which was declared by an act of the diet to be absolute. His son Karl, known to us as Charles XII. (q.v.), succeeded, at the age of 15, to the power and dominions which his father's abilities had consolidated, but which, notwithstanding his own brilliant genius, he so deeply imperiled by his insatiable ambition, that at his untimely death in 1718, at the siege of Frederikshald, after a brilliant career of glorious but checkered military achievements, he left his country overwhelmed with debts, and disorganized by prolonged misrule. With him the male line of the Vasas expired, and his sister and her husband, Frederick of Hesse-Cassel, were called to the throne by election, but were the mere puppets of the nobles, whose rivalries and party dissensions plunged the country into calamitous wars and almost equally disastrous treaties of peace, and, under the leadership of the two great factions of the "Hats," or French party, and the "Caps," or Russian party, demoralized all ranks of society. The weak Adolphus Frederick of Holstein-Gottorp, who was called to the throne on the death of Frederick in 1751, and died in 1771, did little to retrieve the evil fortunes of the state; but his son, Gustavus III. (q.v.) (1771-92), skillfully turned to account the general dissatisfaction of the people with the nobles, to destroy the factions of the Hats and Caps, and to recover the lost power of the crown. His extravagance, dissoluteness, and insincerity detracted, however, from his merits as a ruler, and raised up numerous enemies against him, through whose agency he was assassinated in 1792. His son and successor, Gustavus IV. (q.v.) lacked the ability to cope with the difficulties of the times, and after suffering in turn for his alliance with France, England, and Russia, was forcibly deposed in 1809, and obliged to renounce for himself and his direct heirs the crown in favor of his uncle, Charles XIII., who saw himself compelled at once to conclude a humiliating peace with Russia by the cession of nearly a fourth part of the Swedish territories, with 1½ million of inhabitants. The early part of the reign of Charles, who was childless, was troubled by domestic and foreign intrigues to regulate the choice of an heir to the throne; and when, under the erroneous idea of conciliating Napoleon, the dominant party in Sweden elected General Bernadotte to the rank of crown prince, the latter assumed the reins of government, and by his steady support of the allies against the French emperor, secured to Sweden at the congress of Vienna, the possession of Norway, when that country was separated from Denmark. Under the able administration of Bernadotte, who, in 1818, succeeded to the throne as Charles XIV., the united kingdoms of Sweden and Norway made great advances in material prosperity and political and intellectual progress; and although the nation at large entertained very little personal regard for their alien sovereign, his son and successor, Oscar (1844-59), and his grandsons, the late king, Charles XV., and the present king, Oscar II., who came to the throne in 1872, won a large share of the affections of the Swedes, though the Norwegians are less loyal, owing to their jealousy of the predominance of Sweden, which in 1894-95 threatened to bring on a civil war.

SWEDENBORG, EMANUEL, was b. in Stockholm, Jan. 29, 1688, and died in London, Mar. 29, 1772. His father was Jesper Svedberg, subsequently bishop of Skara. Swedenborg's lifetime divides itself into two distinct periods; the first, ending with his 55th year, was given to business, science, and philosophy; the second, of nearly 30 years, was consecrated to theology and spiritualism. Swedenborg was educated at Upsala, and traveled for four years in England, Holland, France, and Germany. On his return to Sweden, he was appointed by Charles XII. to an assessorship of mines; and rendered some service to that monarch as military engineer. The Swedenborg family was ennobled in 1719, and the name changed from Svedberg to Swedenborg. Swedenborg is sometimes styled count and baron, but erroneously; he was neither, though he had a seat in the Swedish house of nobles. His mind at this time was busy with mechanical and economical projects. He published short treatises on algebra, giving the first account in Sweden of the differential and integral calculus; on a mode of find-

ing the longitude at sea by the moon; on decimal money and measures; on the motion and position of the earth and planets; on the depth of the sea, and greater force of the tides in the ancient world; on docks, sluices, and salt-works; and on chemistry as atomic geometry. In 1724 he was offered the professorship of mathematics at Upsala, which he declined from a dislike of speculative science. Abandoning his desultory studies, he remained silent for eleven years, and devoted himself to the duties of his assessorship and to a systematic description of mining and smelting, and the construction of a theory of the origin of creation. The result appeared at Leipsic in 1734, in three massive folios, beautifully illustrated, entitled *Opera Philosophica et Mineralia*. The second and third volumes describe the manufacture of copper, iron, and brass, and contain an exhaustive record of the best methods in use in last century. The first volume, entitled *Principia, or the First Principles of Natural Things, being new Attempts toward a Philosophical Explanation of the Elementary World*, is an elaborate deduction of matter from "points of pure motion produced immediately from the infinite." This was followed in 1734 by a treatise on *The Infinite, and the Final Cause of Creation; and the Intercourse between the Soul and the Body*, carrying the doctrine of the *Principia* into higher regions, and resolving the soul into points of motion, and one in substance with the sun. Dissatisfied with his conclusions, he determined to track the soul to its inmost recesses in the body. His studies in human anatomy and physiology with this end in view, appeared as *Economia Regni Animalis*, in two volumes, 1741, and as *Regnum Animale*, in three volumes, unfinished, 1744-45. At this point, his course was arrested, and he entered on his career as seer, by which he is known to fame. The particulars of the transition lay in obscurity until 1858, when G. E. Klemming, royal librarian, Stockholm, discovered Swedenborg's diary, kept in 1744. It contains the record of a variety of dreams, visions, and strange communings. After that date, he professed to enjoy free access to heaven and hell. He resigned his assessorship in 1747, that he might devote himself to his office of seer. In 1749 he made his first public appearance in his new character in the issue in London of the *Arcana Cœlestia*, completed in 1756 in eight quartos. His life henceforward was spent between Stockholm, London, and Amsterdam, in writing and printing a variety of works in exposition of his experience and doctrines. There is little in any of these which is not comprised in the *Arcana Cœlestia*, and a few notes on its contents may serve as a description of the whole. With many digressions, the *Arcana Cœlestia* is a revelation of the inner sense of Genesis and Exodus. The early chapters of Genesis are a fragment of an older word, preserved at this day in Tartary, and are not historical in a manner-of-fact sense. Adam signifies the most ancient church, and the flood its dissolution; Noah, the ancient church, which falling into idolatry, was superseded by the Jewish. The spiritual sense pervades the Scriptures, with the exception of Ruth, Chronicles, Ezra, Nehemiah, Esther, Job, Proverbs, Ecclesiastes, the Song of Solomon, the Acts of the Apostles, and the Epistles. No fault is found with these books, but inasmuch as they do not possess the internal sense, they are not the word. The Scriptures are read in heaven in the spiritual sense, but as that sense treats exclusively of God and the human mind, it is void of every reference to earthly scenes, persons, and events. By reason of its symbolism of the inward sense, the letter of Scripture is holy in every jot and tittle, and has been preserved in immaculate perfection since the hour of its divine dictation. The Jewish dispensation having reached its period, God appeared in Jesus Christ. He assumed human nature in its basest condition in the Virgin, wrought it into conformity with himself, "glorified and made it divine." The effluence from the redeemed humanity is the Holy Spirit. In a sense the reverse of Socinian, Swedenborg was a Unitarian. He saw God in the Savior, and regarded him as the sole object of worship. The church initiated by the divine advent came to an end in last century, and Swedenborg witnessed the last judgment effected in the year 1757 in the world of spirits. Then commenced a new dispensation, signified by the New Jerusalem in the Revelation, of which Swedenborg was the precursor, and his writings the doctrine. To the objection, that the doctrine is strange and novel, he replied, that mankind were not prepared for its reception, and that the early Christians were too simple to understand it.

One of the chief ends of his mission was the revival of the lost science of correspondences—the science of sciences in the most ancient times. The law of correspondence is universal; the natural world is the outbirth of the spiritual world, and the spiritual world of the invisible mental world. Unseen evil is manifested in things hurtful and ugly; unseen good, in things useful and beautiful. Man is a summary of nature; nature is man in diffusion; all things, therefore, in nature, in fire, air, earth, and water—every beast, bird, fish, insect, and reptile—every tree, herb, fruit, and flower, represent and express unseen things in the mind of man. The Scriptures are written according to correspondences, and by aid of the science their mysteries are unlocked. By it, too, the constitution of heaven and hell is revealed. There are three heavens, consisting of three orders of angels; the first distinguished for love, the second for wisdom, and the last for obedience. All angels have lived on earth; none was created such. They are men and women in every respect; they marry, and live in societies in cities and countries just as in the world, but in happiness and glory ineffable. All in whom love to

God and man is the ruling principle, go to heaven at death. Between heaven and hell, a perfect equilibrium is maintained. As there are three heavens, there are three hells, and every angelic society has an infernal opposite. Hell, as a whole, is called the devil and Satan; there is no individual bearing that name. All in whom self-love is the ruling motive, go to hell. There is no resurrection of the earthly body. Every one passes to his final lot at death, some making a short sojourn in an intermediate state, designated the world of spirits, where the good are cured of their superficial infirmities and intellectual mistakes, and where the evil are stripped of all their pretenses to good.

Swedenborg professed to enjoy a numerous acquaintance with departed celebrities, and some of his verdicts on character are appalling; for example, he describes king David and St. Paul as among the lost, while Louis XIV. and George II. are distinguished angels. Nor did he confine his intercourse to ghosts from earth, but extended it to souls from the moon and planets, with the unfortunate exceptions of Uranus, Neptune, and the Asteroids. For these visions, enjoyed while sitting in his chamber, he had this explanation: although in the spiritual world there are *appearances* of space, there is nothing of the objective reality which here divides London from Melbourne. If one spirit desires to see another, the desire instantly brings them together. A good man is, as to his mind, in heaven, and an evil man in hell; and supposing the spiritual sight of either was opened—that is, if the eyes of the spiritual body, which transfuse and animate the material ones, were disengaged from their fleshly vesture—he would see his spiritual companions and the country where he would abide after death.

The grand and distinctive principle of Swedenborgian theology, next to the doctrine of the divine humanity, is the doctrine of life. God alone lives. Creation is dead—man is dead; and their apparent life is the divine presence. God is everywhere the same. It fallaciously appears as if he were different in one man and in another. The difference is in the recipients; by one he is not received in the same degree as another. A man more adequately manifests God than a tree; that is the only distinction. The life of devils is God's presence perverted in disorderly forms. "All things, and each of them to the very uttermost, exist and subsist instantly from God. If the connection of anything with him were broken for a moment, it would instantly vanish; for existence is perpetual subsistence, and preservation perpetual creation." By this law of life is explained man's self-consciousness, freedom, and personality. All these sensations are communicated from God to man. He dwells in man so cordially that he gives him to feel that he lives of himself, even as he lives.

Swedenborg made no attempt to establish a sect. When he proclaimed the Christian church at an end his expectation was, that a new church would be raised up among the Gentiles; but toward the close of his life he was silent as to that hope, and spent his energies in attacking Protestant theology, as if bent on the conversion of northern Europe. All his works were written in Latin, and received little attention from his contemporaries. Apart from his visions, there was nothing peculiar about Swedenborg. He was shrewd in worldly affairs, affable in society, and discussed politics and finance in the Swedish diet like a man of the world. He was never married. In diet he was a vegetarian.

Swedenborgians, or, as they designate themselves, "The New Church signified by the New Jerusalem in the Revelation," were first organized as a separate body in 1788 by Robert Hindmarsh, a printer in Clerkenwell, London, who was elected by lot to baptize and to ordain his comrades in the ministry. The Swedenborgians accept Swedenborg's voluminous theological writings as nothing less than revelations from heaven. The body has not had a prosperous existence. The number of its registered members in Britain is little over 6300, divided into 81 congregations. These are chiefly in the large towns and in Lancashire; four are in Scotland, but none in Ireland. At one time there were reputed to be a number of receivers of the doctrines of Swedenborg among the clergy of the church of England. The translator of the *Arcana Cœlestia* was the Rev. John Clowes, rector of St. John's, Manchester, for sixty-two years. He died in 1831, and in the pulpit and numerous publications made no secret of his faith. In the United States the Swedenborgians have nearly 100 societies, and about 6,000 members. They chiefly exist in the northern states; and their largest congregation is in Boston. In France, Germany, Sweden, and Russia, there are Swedenborgians, but few and scattered. There is a Swedenborg society, established in 1810, for printing and publishing Swedenborg's works, with a house in London, and an income of about £200 a year. by Prof. Tafel (ed. 1875). See Life by White (1867) and *Documents* published.

SWEDENBORGIANs organized their first congregation in the United States at Baltimore, 1792; and their general convention in 1817, incorporated under the law of Illinois, and having associations, societies, or members, in nearly all the states. It holds annual sessions in different cities, has a publishing house in New York, a theological school at Waltham, Mass., a Sunday-school union and church music society. Much freedom in regard to ecclesiastical forms is allowed, the power to adopt them being lodged in the whole body of members. The form generally preferred in this country is a modified episcopacy; each state association having its overseer, whose office is permanent. In most of the congregations the worship is partly liturgical, and several

books of prayer have been issued; yet as each congregation is free to adopt its own mode, in some only extemporaneous prayers are offered. There is a congregational union, composed of ministers and churches preferring that order, having its headquarters in Philadelphia, with its own board of publication. There are also independent societies and churches not associated together. And, while the number of those who, in an open profession of Swedenborgian doctrines, have separated from other Christian churches is not large, they believe that in all other denominations many persons have adopted more or less of Swedenborg's views. And it is their avowed and cherished purpose to enlarge this number everywhere. A large sum of money has been devoted to publishing some of the most popular of Swedenborg's books for gratuitous distribution to all who apply for them. As reported in the year 1894-5 there were 102 societies, having about 6075 members.

SWEDISH LANGUAGE AND LITERATURE. See SCANDINAVIAN LANGUAGE AND LITERATURE.

SWEDISH MOVEMENT CURE. See MOVEMENT CURE.

SWEEPS, on shipboard, are oars of great length used in large vessels during a calm, to enable the ship to obtain steerage-way.

SWEETBREAD, the pancreas (q.v.) of an animal, used as food; it is highly esteemed as being both delicate and nutritious.

SWEET-BRIER. See ROSE.

SWEET FLAG. See ACORUS.

SWEET GUM. See LIQUIDAMBAR.

SWEETMEAT, a general term applied to such articles of food as consist chiefly of sugar.

SWEET PEA. See LATHYRUS.

SWEET POTATO. See BATATAS.

SWEETS, a term applied in England, and by the board of inland revenue, to home-made wines, for the sale of which a special license is granted. It is also a term in far more general use for lozenges, comfits, and other preparations of sugar well known to children; they are the *confitures* of the French.

SWEETSER, CHARLES HUMPHREYS, 1841-71; b. Mass.; graduated at Amherst, 1862; entered literary life, and was one of the founders of the *Round Table*, and of the *Evening Mail*, with which he was connected until 1869. He wrote a history of Amherst college, a collection of college songs, and an *Invalid's Guide to the North-west*.

SWEETSER, SETH, D.D., 1807-78; b. Newburyport, Mass.; d. Worcester, Mass.; graduated at Harvard coll., and at the Andover Theol. sem. He was called to the Central Cong. church, Worcester, Mass., 1838, and remained in that pastorate until his death. He was held in high esteem for practical wisdom and theological learning.

SWEET SOP, *Anona squamosa*, a fruit of the same genus with the custard apple (q.v.). It is produced by a small bush, with lanceolate leaves, a native of the warm parts of America, and much cultivated in Brazil, the West Indies, and generally in tropical countries. The fruit is greenish, and resembles an artichoke in size, in form, and in its scaly covering. The pulp is soft, somewhat mealy, sweet, and luscious; with a musky aromatic odor and flavor. It is much used both in the East and West Indies, generally raw, but sometimes cooked. Notwithstanding its foreign origin, it has proved the staff of life to the people of Hindustan in seasons of famine. The seeds are acrid, and the powder of them is used to destroy insect vermin.

SWEETWATER, a co. in s.w. Wyoming, having for its s. boundary parts of Carbon co. and of Utah and Colorado, for its n. boundary Fremont co., and for its w. boundary Vinta co.; area, 10,230 sq. m.; pop. '90, 4941. It is drained by the Green and Big Sandy rivers, and Packers, Sulphur, Bitter, and South Bitter creeks; is nearly bisected by the Wind river range of the Rocky mountains; and is crossed by the Union Pacific railroad. It was set off principally from Fremont co., containing several noted mountain peaks and passes, in 1884. The principal industries are mining and stock-raising. Co. seat, Green River.

SWEET CORN. See CORN.

SWEET WILLIAM. See PINK.

SWEET WOOD. See CASCARILLA.

SWELL, in music, a set of pipes in an organ with a separate keyboard, and forming a separate department, which are capable of being increased or diminished in intensity of sound by the action of a pedal on a series of shades or shutters overlapping each other like Venetian window-blinds, within which the pipes in question are inclosed. On a well-constructed swell, a practiced performer can imitate not only a gradual *crescendo* and *diminuendo*, but also a *sforzando*, a very small opening suffering to make an immediate burst on the ear; while, when the shutters are closed, an imitation of an echo is produced.

SWETCHINE, or **SVETCHIN**, ANNE SOPHIE, 1782-1857; b. Moscow; the daughter of Soimonoff, who was one of the founders of the Academy of Sciences at Moscow. She was brought up at the court of Catherine II., and in 1799 married Gen. Swetchine. She gathered round her Russians and French emigrants of distinction, and her *salon* at St. Petersburg became very celebrated. In 1815 she was converted to Roman Catholicism, and then removed to Paris. After her death, her literary executor, De Falloux published *Mme. Swetchine, sa vie et ses œuvres* (1859); her *Lettres* (1862); *Journal de sa Conversion* (1863); and *Lettres Inédites* (1866).

SWETT, SAMUEL, 1782-1866, American author; b. Newburyport, Mass.; graduated at Harvard college, 1800, and served on the northern frontier during the war of 1812. He wrote a *Sketch of the Bunker Hill Battle* (1818); *Defence of Timothy Pickering against Bancroft's History* (1859); *The Original Planning and Constructing of Bunker Hill Monument*, and a number of other works, including fugitive poems.

SWIETEN, GERARD VAN, 1700-72; b. Leyden, Holland; educated in his native place, and at Louvain; studied medicine at Leyden with Boerhaave, who obtained him the professorship of medicine in 1725. He was a Roman Catholic, and obliged for that reason to resign his chair. He was first physician to Maria Theresa of Austria, 1745, who made him a baron of the empire. By his influence the university was rebuilt, and a system of clinical instruction established at Vienna. He was opposed to the practice of vaccination. For 8 years he lectured on Boerhaave's *Institutes*, and adapted his system to that of his master; content to engraft the result of his own experience upon it instead of founding a school of his own. Besides his comments on Boerhaave, he wrote treatises on the diseases of armies and on epidemics. A statue to his memory was placed in the university by Maria Theresa.

SWIETENIA. See MAHOGANY.

SWIFT, *Cypselus*, a genus of birds of the swallow family. The distinctive characters of the group, of which the true swifts are the type, are noticed in the article SWALLOW. The swifts, like the swallows, are widely distributed, and some are only found in tropical countries; others are birds of passage, and spend the summer in colder parts of the world. Many of the swift group are often popularly called swallows, as that which produces the edible nests of the East Indies. In the genus *Cypselus*, as now restricted, the tail is generally forked, the legs and toes feathered, and very small and weak, all the four toes directed forward. The birds of this genus pass most of their time in the air, and even copulate on the wing. The wings are longer than in any other bird; and the internal structure, even of the skeleton, is peculiarly adapted to prolonged flight. The anatomy more resembles that of humming-birds than of true swallows.—The COMMON SWIFT (*C. apus*) is common in almost all parts of the n. of Europe and of Asia in summer, retiring to tropical or subtropical regions in winter. It occurs even in Lapland. Its residence in its summer quarters is much shorter than that of swallows; and it is worthy of notice, that the swift is seldom to be seen along with any of the swallows or martins, the different kinds choosing different localities, even although very close together. The swift is easily recognized in its flight by the remarkably sickle-shaped wings, and its slight scream is very different from the twitter of the swallow. It is black, with a white throat. It makes its nest in holes of rocks or of walls, often in those of houses. The nest is formed of bits of straw, dry blades of grass, and bents, feathers, and other such substances, which are apparently glued together by a mucous secretion. The swift sometimes builds in hollow trees. Swifts, like swallows, seem to return to the same place to make their nest, year after year, and repair the old nest, instead of making a new one.—The ALPINE SWIFT, or WHITE-BELLIED SWIFT (*C. alpinus*), is rarely seen in Britain, but is common in the more southern countries of Europe. It builds in high rocks, sometimes in steeples. It is larger than the common swift, and is the largest of the British *Hirundinidae*. Its wings are even longer in proportion than those of the common swift. Its voice is sweet, not a scream like that of the common swift.—The AMERICAN SWIFT (*Chaturapelasgia*) has the hind-toe directed backward, and the tail feathers stiff and pointed, as in woodpeckers. It is a small bird, not above 4½ in. in entire length, but 1 ft. in extent of wing. The general color is brownish black, with greenish reflections, the throat grayish white, the under parts grayish brown. The nest is made of small dry twigs, which the bird breaks off from the tree, and carries away in its feet; and they are attached by means of the saliva, to the rock, wall, or hollow tree where the nest is made. From its frequently building in chimneys, this species is known as the *Chimney Swallow* in North America. Great numbers often build together. See illus., LARKS, ETC., Vol. VIII.

SWIFT, a co. in w. Minnesota, drained by the Minnesota, Chippewa, and Pomme de Terre rivers; intersected by the Great Northern railroad; about 653 sq. m.; pop. '90, 10,161, chiefly of American birth. The surface is mostly level, with little timber. The soil is extremely fertile. The principal production is wheat. Co. seat, Benson.

SWIFT, JONATHAN, the greatest of English satirists, and the most original writer of his age, was born in Dublin, but of English parents, on Nov. 30, 1667. He was a pos-

thumous child, reared amid circumstances of abject poverty and dependence, the recollection of which galled his proud irascible spirit, and embittered much of his future existence. He was supported by relatives, and educated at Kilkenny school and Trinity college, Dublin. He proved a negligent and turbulent student, more intent on personal satires and political rhymes than academical honors: but he remained at college about seven years. He then removed to England, visited his mother in Leicestershire, and by her recommendation was admitted into the house of sir William Temple, who had long known the Swift family. He seems at first not to have conciliated the regard of the retired minister, for in the following year (May, 1690), Temple made an offer of the services of his protégé to sir Robert Southwell (then about to proceed to Ireland as secretary of state), recommending him as diligent and honest, qualified either to wait on sir Robert as a gentleman, or to write under him as a clerk. No appointment followed; Swift remained with Temple, studying hard, till 1694, when he went to Ireland, took orders in the church, and obtained a small living, which he threw up in two years, and returned to England, in consequence of Temple, who missed his society and assistance, urging him to come back. Temple died in 1698, and Swift in the following year, published his posthumous works, after which he again repaired to Ireland, obtaining from lord Berkeley some church preferments, including the vicarage of Laracor, worth in all about £400 per annum, which was all the professional income he enjoyed till he was appointed dean of St. Patrick's, in his 46th year. Before this, he had written the wildest and wittiest and most powerful satirical work of the 18th c., *The Tale of a Tub* (1704), also a few essays on ecclesiastical subjects, some inimitable ridicule of astrology under the name of Isaac Bickerstaff, and poetical pieces possessing a peculiar vein of humor and description. In 1710 he went over to the Tories, conceiving himself neglected by the Whig ministers, and exerted himself strenuously in behalf of his new allies, Harley and Bolingbroke. He wrote papers in *The Examiner* (1710); a *Letter to the October Club* (1711); *The Conduct of the Allies* (1712); *The Barrier Treaty* (1712), and innumerable pasquinades against the Whigs, whom he "libelled all round." He had become, as it were, a great and formidable power in the state, yet could extort no higher preferment for himself than the deanery of St. Patrick's. His party was overthrown by the death of queen Anne; and in 1714 Swift "commenced Irishman for life," with strong reluctance and disgust. In time, however, he took interest in Irish affairs, and identified himself with Irish feelings and prejudices. Hatred to Walpole and the English government quickened his activity; and his resistance to Wood's copper coinage—a scheme for supplying Ireland with copper money by an English patentee—raised him to the highest pinnacle of popular favor. His *Drapier Letters* (1724) produced quite a ferment in Ireland, and compelled the government to abandon the scheme of the coinage. Two rewards of £300 each had been offered for the unmasking of the Drapier, but not a traitor, as he says, could be found to sell him. The triumphant author made his last visit to England in 1726, and published his *Gulliver's Travels*, the most universally popular of all his works. He next joined with Pope, Arbuthnot, and Gay in publishing three volumes of *Miscellanies*, after which he returned to Ireland (Oct., 1727), and never left it again. He was subject to fits of giddiness and deafness, which increased in frequency and intensity as he grew old; he brooded over the anticipated madness which he foreboded would be his future lot; his temper, always irritable and gloomy, became more violent and morose, the effect of cerebral disease, and his memory and other faculties gave way. There was also a deep and secret grief: the fate of two ladies, known as Stella and Vanessa, had been inseparably entwined with his own destiny; both had sacrificed for him all but honor, and had sunk under disappointed hopes and blighted affection. We cannot here trace the painful story, which is still involved in mystery, but for a time the retribution of Swift was terrible. He rallied, however, and wrote some of his best minor pieces after this period. Among these are *The Grand Question Debated*; *On Poetry, a Rhapsody*; *The Legion Club*; *Verses on the Death of Dr. Swift*; and that extraordinary prose tract, *The Modest Proposal*, a masterpiece of irony, in which he proposes to relieve the distresses of the poor Irish by converting their children into food for the rich. The last three years of Swift's life were passed in almost total silence in the hands of keepers. He died Oct. 19, 1745.

It would be superfluous to attempt in our brief space to characterize the genius of the immortal dean of St. Patrick's. Shakespeare alone among English authors has received a greater amount of criticism and annotation. From Johnson to Thackeray, the most brilliant critics and biographers have employed themselves in elucidating his strange and sad history, and in estimating his writings. As a consummate master of ridicule and irony, possessing great powers of wit, invention, illustration, and analogy; possessing also the dramatic faculty that enabled him to assume and portray varieties of character; and as writing a pure, perspicuous English style, unsurpassed for strength and simplicity, Swift must ever be a model in our language and literature. His misanthropy, or degradation of human nature—his Yahoos, Strulbrugs, daring irreverence, and indelicacy, are of course indefensible. He had a total incapacity, as De Quincey remarks, for "dealing with the grandeurs of the human spirit, with religion, with poetry, or even with science, when it rose above the mercenary practical." His business was with the

world—with the follies, vices, and absurdities of men. And his poetry is the same as his prose; it may come under his definition of a good style, "proper words in proper places," applied to ordinary topics, but is wholly wanting in passion, elevated feeling, and imagination. A complete edition of his works, in 19 vols., was published by sir W. Scott (1815). See also Roscoe's edition (1853), and *Life* (unfinished), by John Forster (1875).

SWIFT, JOSEPH GARDNER, LL.D., 1783–1865; b. Mass.; in 1802 graduated at West Point, the first graduate from the academy. He was commissioned in the engineers, rose to be chief of the corps with rank of colonel, and in the war of 1812 served on Pinckney's staff and later had charge of the defenses of New York. In 1815 he was superintendent and inspector of West Point; resigned in 1818, and became surveyor of the port of New York. From 1829 to 1845 he was engaged in the harbor improvement of the great lakes, and in this period superintended the construction of the New Orleans and lake Pontchartrain railroad, a work of great difficulty on account of the swamps. In 1833 he was chief engineer of the New York and Harlem railroad.

SWIFT, LEWIS, b. at Clarkson, Monroe co., N. Y., 1820. He early became a lecturer and experimenter in physics, but after 1855 gave his chief attention to the study of comets and to general astronomy. His discoveries and observations, made as director of the Warner observatory at Rochester, N. Y., won for him honorable recognition in America and Europe.

SWIFT, WILLIAM H., b. Mass., 1800; educated at West Point. He joined Long's Rocky mountain expedition in 1818, and was on topographical duty, 1821–32, making surveys on the Chesapeake and Ohio canal, the Florida canal, and several railroads. For the ten years from 1832 he was attached to the geodetic survey of the Atlantic coast, supervising the river and harbor improvements, 1837–42. He was also constructing engineer of the Western railroad in Massachusetts, 1836–40. He supervised the construction of the Minot's Ledge light-house, 1847–49. Resigning from the army in 1849, he became president of the Philadelphia, Wilmington and Baltimore railroad, and afterward of the Western railroad, and the Illinois and Michigan canal. He d. 1879.

SWILLY, LOUGH, an inlet of the Atlantic on the n. coast of Ireland, in the county of Donegal, enters between Dunaff head on the e., and Fanad point, on which there is a light-house, on the west. Length 25 m.

SWINBURNE, ALGERNON CHARLES, one of the first of living English poets, is the son of Admiral Charles Henry Swinburne, by lady Jane Henrietta, daughter of the third earl of Ashburnham, and was born in London on April 5, 1837. He entered as a commoner at Balliol college, Oxford, in 1857, but left the university without graduating. His first literary venture, a volume published in 1861, containing two plays, *The Queen Mother and Rosamund*, attracted little attention; but *Atalanta in Calydon*, a tragedy, which appeared in 1865, at once established his reputation. Afterward came *Chastelard*, a tragedy (1865); *Poems and Ballads* (1866); *A Song of Italy* (1867); *Siena* (1868); *Songs before Sunrise* (1871); *Bothwell*, a tragedy (1874); *Erechtheus* (1875); a new series of *Poems and Ballads* in 1878; *Songs of the Springtides* (1880); *Mary Stuart, a Tragedy* (1881), which, taken in connection with *Chastelard* and *Bothwell*, completes a dramatic trilogy; *Tristram of Lyonesse*, and *Other Poems* (1882); *A Century of Roundels* (1883); *A Midsummer Holiday* (1884); *Marino Faliero, a Tragedy* (1885); and *The Armada* (1888); *Astrophel and other Poems* (1894); *The Tale of Balen* (1896). As a poet he can hardly be said to have fulfilled the promise of his youth. His passion and vehemence and extraordinary command over unsuspected sources of melody caught the public ear almost from the first, and made men believe that a great new lyric poet had arisen. But in the judgment of many critics he has little power of sustained thought or imagery; he is ever ready to sacrifice sense to sound; his poetry is mere music, and the music is always set to the same tune. Swinburne belongs to what has been aptly called the "fleshy school" of poetry, and even those who most admire his power of poetical expression, richness of coloring, and happy lyrical effects must deplore the sensuous tone of his muse. He has also been severely animadverted upon for the wanton violence with which he attacks the most sacred beliefs of his fellow-men. Swinburne is well known in the department of poetical criticism. His prose, much of which is admirable, includes *William Blake, a Critical Essay* (1868); *Essays and Studies* (1875); *Note on Charlotte Brontë* (1877); *A Study of Shakespeare* (1879); *Life of Victor Hugo* (1886); *A Study of Ben Jonson* (1890); *Studies in Prose and Poetry* (1894); besides essays contributed to periodical literature and to the *Encyclopædia Britannica*.

SWINDON, an old market t. of Wilts, 77 m. w. of London by the Great Western railway. It contains a handsome church, large corn exchange, and excellent shops. About a mile n. of the town is Swindon junction, the great central establishment and manufactory of the Great Western railway company. A considerable town has risen around the station, called the New town, and containing a beautiful church, public park, library, and mechanics' institute. Pop. '91, of Old town, 5545; of New town, 27,295.

SWINE. See Hog.

SWINE-OAT. A species of oats (the *avena nuda*) cultivated in some parts of England as food for swine.

SWINE-PLAGUE, or **HOG CHOLERA**, an infectious disease produced by a bacteroid schizophyte, a microscopic organism having the power of indefinite multiplication in the system. The symptoms and pathological conditions vary considerably, depending upon the virulence of the disease, this depending very greatly upon the number of animals kept together, crowding greatly aggravating the disease. At the commencement of the attack the animal is generally seized with a shivering, which may last from a few minutes to several hours. There is also frequent sneezing and more or less coughing. The temperature of the body is also increased, ranging from 104° to 106° Fahr. but this symptom is variable, and not to be relied upon; and it is difficult to ascertain the temperature of a hog. The shivering, coughing, and sneezing are soon followed by loss of appetite and the rough appearance of the coat. Drooping of the ears is characteristic, and sometimes the animal attempts to vomit. Swelling of the head often takes place, and eruptions appear on the ears and other parts of the body. There is frequently bleeding from the nose, swelling of the eyelids and partial or total blindness, accelerated breathing; sometimes constipation, and sometimes diarrhea. There is rapid emaciation, and a vitiated appetite for dung and dirt, and a peculiar, offensive odor to the exhalations which is characteristic. This odor is so penetrating as to be observed in a large herd at the distance of half a mile. On examining the chest by auscultation a rubbing sound is heard which indicates inflammation of the pleural membrane. Sometimes there is extensive ulceration and sloughing of the snout and gums. If the subjects have been recently ringed with wire in the nose, the wounds thus made have a great tendency to ulcerate, and the disease may be communicated through wounds or abrasions of any kind. Post-mortem examinations reveal more or less hepatization of the lungs, with accumulation of blood, serum, and exudation in the lung tissue. Sometimes the solidification from hepatization is sufficient to cause the lung to sink in water. Sometimes the hepatization occurs only in isolated places, but sometimes extends over the whole lung. Gray and red hepatization may exist side by side. The lymphatic and mesenteric glands are always more or less enlarged. There is generally more or less exudation of plastic material, and more or less adhesion between the lung and the walls of the chest. Sometimes the adhesion involves the whole lung. The heart is generally more or less affected. Sometimes it is flabby and dilated, but more frequently congested, the capillaries, particularly of the auricles, being gorged with blood. Nearly all cases present characteristic morbid changes in the upper part of the large intestine, consisting of ulcerous tumors of the mucous membrane, varying in size from a pin's head to that of a quarter of a dollar. The other intestines are similarly affected, although in a less degree. Ulcerous tumors are also sometimes found upon the gall bladder and upon the mucous membrane of the stomach. The serous membrane of the abdominal cavity is also inflamed, so that there will be adhesions between different parts of the intestines, or between them and the peritoneal lining of the abdominal walls. Indeed, in the worst cases, it may be said that scarcely an organ escapes sufficiently not to exhibit lesions visible to the naked eye. A microscopic examination of the blood, or blood serum, or exudations, reveals great numbers of schizophytes in various stages of formation, some in separate minute globules, of micrococcus stage, some in aggregated masses, and some in bacillus rods. The disease is communicable to other animals by inoculation, and rats may contract it and cause it to spread. Dogs appear to have but little susceptibility, but do sometimes contract the disease. The extreme cold of winter checks the spread of the complaint, but the disease germs, or schizophytes, are not killed by it, although the thermometer may mark 30° below zero. The above information is chiefly taken from the reports of Dr. H. J. Detmers of Chicago to the governmental agricultural bureau at Washington; and the following is from a paper read before the state microscopical society of Illinois, April 8, and published in *Science* of May 7, 1881: "1. It has been and can be everywhere observed, where swine-plague is prevailing, that the infectious principle floating in the air is attracted and taken up by sores, wounds, and even scratches, but does not enter the animal organism through the whole skin and through perfectly healthy respiratory mucous membranes. 2. Antiseptics, or medicines which are either directly poisonous to the lower forms of organic life or destructive to those conditions under which low forms of organic life thrive and develop, and among those antiseptics, especially carbolic acid, iodine, hyposulphite of soda, benzoate of soda, thymol, etc., have proved to constitute almost sure prophylactics. . . . Further, the various antiseptics which have proved to be good prophylactics are very dissimilar in their chemical affinities and actions, and their prophylactic effect cannot very well be explained if the infectious principle were a chemical agency, a virus, or a poison, but is explained if the same consist in something endowed with life and power of propagation. . . . 6. If the causé and infectious principle of the swine-plague were a chemical poison or virus, one would suppose a cessation of the morbid process would be impossible, and an animal would never recover while its organism contained an abundance of the infectious principle in an effective condition, as is undoubtedly the case, because convalescents and animals nearly recovered frequently communicate the disease, even in a fatal form, to other healthy pigs. Further,

the fact that an animal, once recovered, possesses but little predisposition for future infection, or is seldom attacked a second time, even if ever so much exposed, and then only contracts the disease in a comparatively mild form, could never be explained; but the whole presents an entirely different aspect, and admits of explanation if low and minute forms of organic life, such as the schizophytes of swine-plague, which by developing and multiplying finally destroy or exhaust in an animal organism the conditions necessary to future development and propagation, constitute the cause and the infectious principle." Dr. Detmers says that the swine-plague schizophytes, although having the same general characteristics when cultivated in fluids artificially as when developed in the animal, have less uniformity in size and develop rather slower. He concludes that they are less vigorous; and therefore when an animal is inoculated with them the disease produced is milder than when propagated in the ordinary manner, or by material taken from the body of a diseased hog. Sometimes, however, owing to other circumstances, inoculation with cultivated schizophytes produces a virulent form of the disease. In regard to prevention, Dr. Detmers, in his report to the commissioner of agriculture, July, 1879, takes the ground that measures of extermination must be thorough. He advises: 1, "that a competent and reliable person be appointed in every county, or where a great many hogs are raised, and where the country is thickly settled, in every township, with authority to institute, superintend, and enforce a strict execution of such measures of extinction and prevention as may be authorized by law; 2, that every owner of hogs or pigs must be compelled by law to inform the above officer, say within 12 hours after the occurrence, of every case of swine-plague in his herd, or any herd, that may come to his knowledge; 3, that every hog or pig showing symptoms of swine-plague must be immediately destroyed and buried from 4 to 6 ft. deep, or cremated, and that all exposed hogs be kept under quarantine for several weeks or killed; 4, that all infected premises be thoroughly cleaned and disinfected, and remain unoccupied for six weeks or two months; 5, that no hog or pig be allowed to run at large or to have access to running water if swine-plague has made its appearance within 10 m.; 6, that railroad companies and other public carriers be forbidden to receive and load hogs from any township or county after having been notified by the proper officer that swine-plague is there existing, except by special permit of such officer, and various other restrictions. The treatment most relied on is good care, uncontaminated and pure food and water, perfect cleanliness, and separation from sick animals and all other sources of infection."

SWINEMÜNDE, a maritime and fortified t. of Prussia, province of Pomerania, is situated on the island of Usedom, at the entrance of the narrow channel of Swine, which connects the Grosses Haff (into which the Oder flows) with the Baltic. Swinemünde, as in some sense the port of Stettin (q.v.), carries on a considerable commerce, and has also valuable fisheries, but it is chiefly noted for its excellent sea-bathing, for which it is much frequented. The lighthouse of S. is 210 ft. high. Pop. '95, 9391.

SWING, DAVID, D.D., b. Cincinnati, 1830; educated at the Miami Univ., Oxford, O.; was principal of the Oxford Grammar School for 12 years. He became pastor of a Pres. church in Chicago, where his original style of thought and his bold though modest utterance commanded public attention, and excited the criticism of those who prized the form of sound words established by ecclesiastical authority. In the interest of peace Dr. S. retired from his pastorate and from the Pres. ministry; his supporters went with him to a public hall, where he has since preached to one of the largest congregations in Chicago. His preaching, though diverging from the verbal standards of "orthodoxy," was essentially evangelical and spiritual, as well as marked by intellectual power. Prof. Swing published *Truth for To-Day*, *Motives of Life*, *Sermons*, and *Club Essays*, and was a frequent contributor to magazines and newspapers. He died in 1894.

SWINTON, JOHN, b. Scotland, 1830; educated at East Hampton, Mass. He was at one time chief of the editorial staff of the *New York Times*, and held a similar position on the *New York Sun*; editor of *John Swinton's Paper*, since 1883. Among his writings are *European Travels*, *The Chinese Question*, and *Life of John Brown*. He is active as a propagandist of "the principles of equal rights for all men."

SWINTON, WILLIAM, b. Edinburgh, 1833; removed to the United States when ten years old, and pursued his studies at Amherst College. In 1853 he was a teacher in a female academy in Goldsborough, N. C.; but soon after settled in New York; where he devoted himself to study, and to making translations from the French, the most important being that of Rousseau's *Confessions*. On the outbreak of the civil war he was sent to the front as war-correspondent for the *New York Times*, and served principally with the army of the Potomac, of whose career he was afterward a historian. Soon after the war he was appointed professor of *belles-lettres* in the university of California at Oakland. Later in life he devoted himself to writing educational works. Swinton published *Rambles among Words*; *Campaigns of the Army of the Potomac*; *The Twelve Decisive Battles of the War*; and geographies, grammars, and reading-books. D. 1892.

SWISHER, a co. in n.w. Texas; formed 1876; organized 1890. Area, 900 sq. m. Pop. '90, 100. Co. seat, Tulia.

SWISS GUARDS, first employed in the French service in 1616. It was the policy of the royal family to render these guards personally faithful to themselves, and to estrange them from the other soldiers and the common people. How well they succeeded was shown by the slaughter of 1792 at the Tuileries. The *Lion of Lucerne*, erected in 1821, commemorates their valor. The Swiss guard also existed in France under Louis XVIII., and up to 1830. A body of Swiss guards have long acted as the pope's guard at the Vatican.

SWISSELM, JANE GRAY CANNON, b. Wilksburg, Penn., 1815; editor of the *Pittsburg Saturday Visitor*, 1845-56; of the *St. Cloud (Minn.) Visitor*, 1858; and of the *St. Cloud Democrat*, 1858. She was also a contributor to *Neal's Gazette*, *The Dollar Newspaper*, *The Spirit of Liberty*, *The Commercial Journal*, *New York Tribune*, etc.; and pub. *Letters to Country Girls* and *My First Holiday*. She dealt forcibly with political and social life in the interest of reform. She d. 1884.

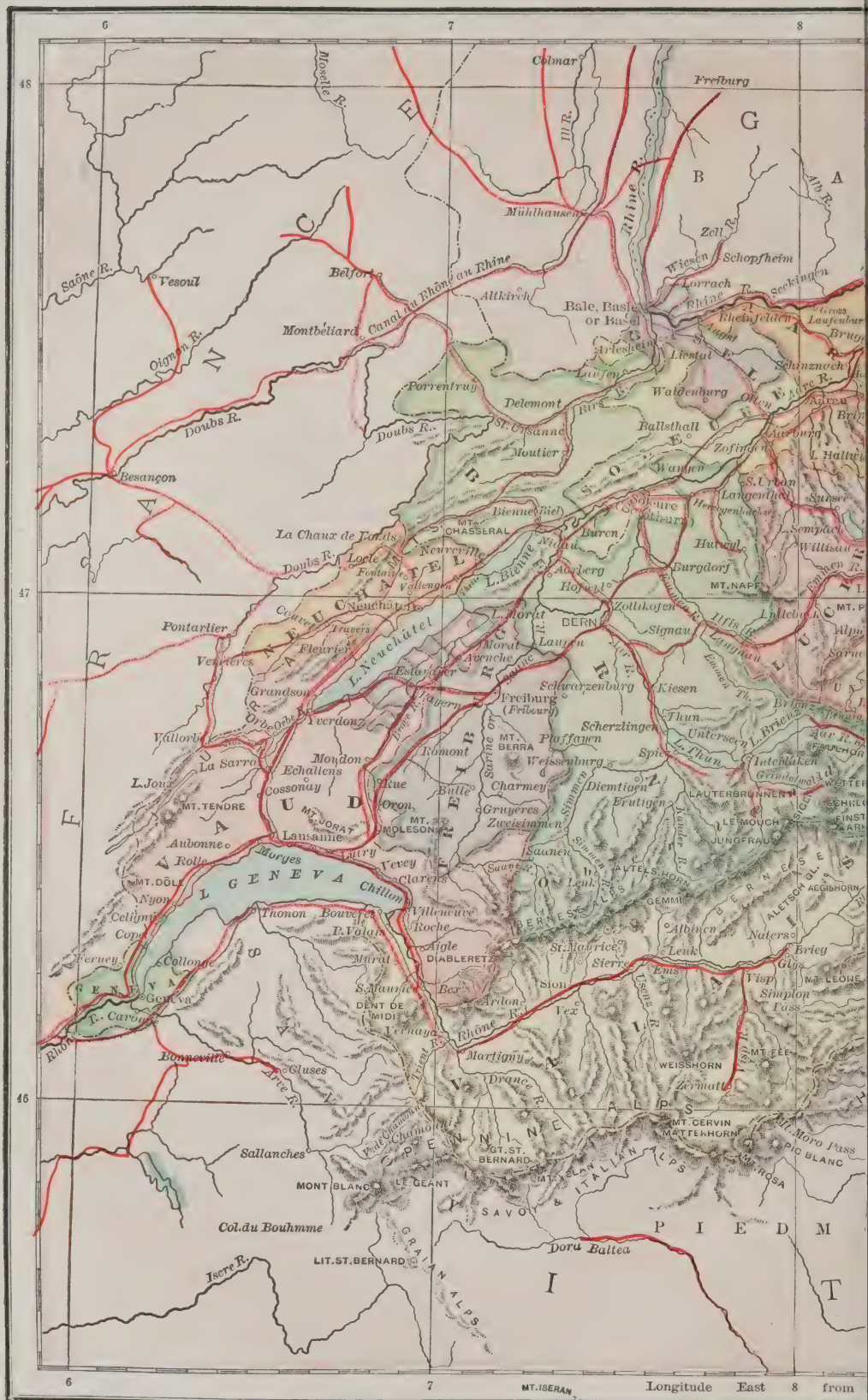
SWITHIN, SAINT, an English ecclesiastic of the 9th c., who was chaplain to king Egbert, and tutor to his son Ethelwulf, under whom, when he came to the throne, he held the office of chancellor. He had the charge of the education of king Alfred, whom he accompanied to Rome. In 852 he was consecrated bishop of Winchester. According to William of Malmesbury, he was "a rich treasure of all virtues, and those in which he took most delight were humility and charity to the poor." He adds that he built several churches, and traveled through his diocese with his clergy on foot, and for the most part by night, in order to avoid the appearance of ostentation. The origin of the tribute called "Peter-pence" (q.v.) has been often assigned to Swithin, and he is said to have procured an act of the Wittenagemote, enforcing, for the first time, the universal obligation of paying tithes. Swithin died on July 2, 862, and was buried, according to his own desire, in the churchyard of Winchester. A century later he was canonized; and the monks, not considering this a fitting place of sepulture for a saint, exhumed his body, for the purpose of depositing it in Winchester cathedral; but this translation, which was to have taken place on July 15, was delayed in consequence of violent rains, which continued without intermission for 40 days. Out of this circumstance arose the still current belief, that if rain fall on July 15, it will continue to rain for 40 days. Experience certainly shows that when a period of wet weather sets in about the summer solstice, it generally proves of considerable duration; and we find a similar superstition popularly attached in different countries of Europe to the festivals of various saints, which occur about the same period of the year. In France, the watery saints' days are those of St. Médard (June 8), and St. Gervais and St. Protas (June 19), the meteorological canon being—

S'il pleut le jour de Saint Médard,
Il pleut quarante jours plus tard;
S'il pleut le jour de St. Gervais et de St. Protas,
Il pleut quarante jours après.

The rainy saint in Flanders is St. Godeliève, and in Germany there are three saints' days to which this belief attaches, one being that of the Seven Sleepers.

SWITZERLAND (Ger. *Schweiz*; Fr. *Suisse*; It. *Svizzera*) is an inland country of Europe, situated between 45° 48' to 47° 49' n. lat., and 5° 55' to 10° 30' e. long. Its greatest length from e. to w. is 180 m., and its greatest width from n. to s., 130 miles. Its superficial area, without including lakes, is 15,233 sq.m., or one-fourth of that of England and Wales. In 1888 the pop. of Switzerland was 2,918,179; in 1894 according to estimates, 2,986,848. The following table from the *Statesman's Year Book* for 1897 gives the results of the census of 1888 and the estimates for 1894.

| CANTONS. | Area in Eng. Sq. Miles. | Population, 1888. | Population, June, 1894. |
|----------------------------|----------------------------|----------------------|----------------------------|
| Zürich | 666 | 337,183 | 351,917 |
| Bern | 2,657 | 536,679 | 541,051 |
| Lucerne | 579 | 135,360 | 135,813 |
| Uri | 415 | 17,249 | 17,249 |
| Schwyz | 351 | 50,307 | 50,581 |
| Unterwalden | 295 | 27,581 | 27,781 |
| Glarus | 267 | 33,825 | 33,535 |
| Zug | 92 | 23,029 | 23,167 |
| Freiburg | 644 | 119,155 | 122,058 |
| Soleure | 302 | 85,621 | 89,290 |
| Basel | 177 | 135,690 | 144,283 |
| Schaffhausen | 114 | 37,783 | 37,465 |
| Appenzell (exterior) | 162 | 66,997 | 68,515 |
| St. Gall | 779 | 228,174 | 241,055 |
| Grisons | 2,773 | 94,810 | 95,469 |
| Aargau | 542 | 193,580 | 190,246 |
| Thurgau | 381 | 104,678 | 108,480 |
| Tessin, or Ticino | 1,088 | 126,751 | 127,940 |
| Vaud | 1,244 | 247,655 | 256,242 |
| Valais | 2,027 | 101,985 | 103,236 |
| Neuchâtel | 312 | 108,153 | 111,928 |
| Geneva | 108 | 105,509 | 109,557 |
| Totals | 15,975 | 2,917,754 | 2,986,758 |





Surface.—Switzerland is the most mountainous country of Europe. Its principal chains are the Alps (q.v.) and the Jura (q.v.). The former run from e. to w. along its southern or Italian frontier. Their ramifications fill more than one-half of the country, and terminate along a line which may be traced from Vevey, on the lake of Geneva, to mount Moleson and mount Napf, across lake Zug, to the southern shores of the lakes of Zürich and Wallenstadt, and Sargans on the Rhine. The mean elevation of the highest chain is from 8,000 to 9,000 feet. The Jura run n.e. from the western corner of Switzerland. They consist of a series of parallel ridges inclosing long and narrow valleys, and their mean elevation does not exceed 4,000 feet. In the angle formed between them and the Alps lies the plain of Switzerland, a table-land 100 m. in length, and from 20 to 30 m. in width, with a mean elevation of about 1400 ft. above the sea. It is not absolutely level, but covered with elevations, which seem very unimportant, however, when contrasted with the huge masses of the Alps and Jura. It has been described, and not inaptly, as a corner of southern Germany, penetrating like a wedge between France and Italy. The communication between the plain of Switzerland and the German valleys of the Danube and Rhine is not, however, continuous. The plain on the e. terminates in a third hilly tract—the Thur hill-country, which lies between the lakes of Zürich and Constance, and which, to some extent at least, forms a barrier between the plain of Switzerland and Germany. The Jura, the plain, and the hill-country are, then, the great divisions of northern Switzerland. The divisions of the Alpine region are more strongly marked in nature. A glance at the map will show that the chains which overspread it radiate from a mountain knot lying to the w. of the Grimsel pass. They isolate and inclose (1) the valleys drained by the Rhone, which connect Switzerland with southern France; (2) Ticino, drained by streams which descend to the Po, and have at all times brought this country into close communication with Italy; (3) The Grisons, the most sequestered valleys of Switzerland, drained by the tributaries of the Rhine and Danube, and shut out by mountains from the lower basins of these rivers; (4) The Bernese Oberland, which slopes toward the western extremity of the Swiss plain; (5) The district of the forest cantons—Schwyz, Uri, and Unterwalden—surrounding the lake of Lucerne, and which slope toward the eastern extremity of the plain, and seem a great mountain fortress erected in the very heart of Switzerland, to protect the plain against German invasion.

Geology is of little importance in explaining the general geography of Switzerland. It may, however, be stated that in the southern Alpine region the rocks are crystalline; that in the northern Alpine region they belong to the jurassic and other upper secondary strata; and that in the plain and the great part of the hill-country they consist of loose tertiary sands and clays, which supply the best agricultural soils of Switzerland. Those rocks and formations in which mines and coal chiefly abound are absent.

Climate.—In Switzerland the climate chiefly varies with elevation above the sea-level. At a height exceeding 9,500 ft., the mountains are covered with perpetual snow, which descends along the hollows in glaciers (q.v.) to a much lower level, and in this way covers the elevated part of the country with a vast sea of ice. Below the level of perpetual snow, the surface of Switzerland has been divided into a series of belts, characterized by different climates and productions. The highest of these, lying between the snow and the level of 6,900 ft., has been called the upper Alpine region. In it the glaciers fill the valleys, but plants clothe the scanty soil of the ridges. The second or lower Alpine belt descends to 4,800 feet. It is a country of pastures, in which shrubs but no trees make their appearance. The Righi Pass, the Grimsel Hospice, and the Splügen are included in it. The third belt descends to 4350 feet. The meadows still abound in it, but forests of firs and maples in many parts replace them. It includes Urfenthal and Oberengadin. The fourth belt sinks to 3,000 feet. The forests still abound, the beech being the prevailing tree. The meadows are excellent, and rye and barley are successfully cultivated. It includes Weissenstein, Grindelwald, and Engelsberg. The fifth belt lies above 1800 feet. In it the oak and walnut are the characteristic forest trees. Spelt and the best wheat are cultivated. It includes Bern, Coire, and St. Gall. The last belt sinks to 750 feet. In it the chestnut is the characteristic tree; the mulberry and the vine are extensively cultivated, and wheat is the grain chiefly grown. This belt includes the greater part of the Swiss plain, and sinks to its lowest level in the valley of the Rhine, between Constance and Basel, and the banks of lake Zürich and the lago Maggiore. In the last district the vegetation is that of northern Italy. At a higher elevation than 6,400 ft., Switzerland is only inhabited by herdsmen during the summer months. At this limit, however, permanent abodes begin to make their appearance; and at 4,000 ft. there are many villages. The most populous part of Switzerland, however, lies between 1250 and 2,150 feet. The temperature of this region is fairly represented by that of Zürich, which we will compare with that of London. The temperature of Zürich is in winter 30.34°; in spring, 47.25°; in summer, 64.15°; in autumn, 49.05°; for the year, 47.95°. The temperature of London is in winter, 38.22°; in spring, 48.34; in summer, 61.74°; in autumn, 50.29°; for the year, 50.50°.

Productions.—In Switzerland, where good coal is not to be had, and where the houses are built of wood, the forests, which cover one-sixth of the whole surface, acquire very great importance. Wood-cutting is one of the chief employments of the people. The trees cut down in the highlands are deprived of their branches, and shot with inconceiv-

able rapidity over the slopes to the valleys below, whence they are removed by rafts, not only to different parts of Switzerland, but to France and Germany. It is, however, the mountain-pastures and the meadows, forming two-fifths of the whole surface of the country, that supply the chief occupations of the people—those of herdsmen and shepherds. During the summer the cattle are driven into the mountains, and tended by herdsmen, who take up their abode in the rude wooden huts known as *châlets*, and there the butter and cheese are made. In summer it is estimated that there are in Switzerland upward of a million of horned cattle, one-fourth of which consists of milch cows. The produce of the dairy annually is valued at between one and two millions sterling. The best breeds of cattle are those of Saanen and Simmenthal in Bern, Gruyères in Freiburg, Schwyz, Zug, Entlebuch, Pralligau in the Grisons, and Glarus. The best cheese is made at Emmen, Saanen, Simmenthal, Gruyères, and Ursern. The sheep of Switzerland are of inferior breed, and their wool is short and coarse; but the goats are numerous and fine. More than two-thirds of Switzerland does not supply corn enough to feed its inhabitants. The plain, however, is a fertile agricultural country. In Vaud and Neuchâtel the cultivation of the vine is the chief occupation of the people; and in the Thur hill-country, more particularly on the shores of the lake of Constance, there are extensive orchards, in which are prepared cider and *kirschwasser*, the latter being a liquor largely consumed in Switzerland. It will give some idea of the extent to which Switzerland is cultivated to state, that out of every 100 sq. m. of surface, 30 are occupied by rocks, glaciers, and water; 20 by hill-pastures; 17 by forests; 11 by arable lands; 20 by meadows; and 1 by vineyards. In the uncultivated part of the country the bear, the wolf, and the larger birds of prey are still met with; and the chamois (q. v.) is hunted. The rivers and lakes abound with fine fish, and more especially with trout.

Manufactures.—The manufacturing districts are not scattered over the whole surface of the country, but are met with chiefly on the northern frontier. The largest number of employees are engaged in the cotton industry. Next in importance are the manufacture of silk, watch making, machine making, and wood working. Zürich is an important center for the manufacture of silk-stuffs and cottons. Cottons are also manufactured extensively at St. Gall, Appenzell, Aargau, and Glarus; the two last named cantons also containing important manufactures of linens, silks, and hosiery. Basel produces silk-stuffs, leather, paper, and tobacco; Neuchâtel, watches and cottons, and Geneva, watches and jewelry.

Commerce.—Although Switzerland is inland, its commerce in proportion to the population has long exceeded that of any other country on the continent of Europe. A Swiss official report for 1894 says, "Switzerland imports each year one-half of that upon which its population subsists. On the other hand it exports about one-third of what it produces. No other nation finds itself in a like situation." In 1895 the leading imports, in the order of their importance, were raw silk, grain, animals, coal, woolen goods, raw cotton, and wine; and the chief countries from which she derived her imports were Germany (which supplied about 29%), Italy, France, Austria-Hungary, Russia, England, and the United States. Her chief exports were, in the order of their importance in 1895, silk goods, cotton goods, watches and cheese, and the leading countries to which Switzerland sent her exports were Germany, with about one-fourth of the export trade, Great Britain, the United States and France. Between 1892 and 1895 there was a customs war between Switzerland and France, which influenced considerably the commerce of the two countries. As to the trade of Switzerland with the United States, it would appear from the figures for 1895 that the latter country sells to S. comparatively little of silk, wool, linen, iron, wood, paper, farm animals, agricultural products and food for animals, but that it does sell considerable amounts of raw cotton, chemical preparations, manufactures of leather, India rubber and raw tobacco. To the United States the leading articles exported from Switzerland are silk and cotton manufactures; food products, such as cheese and condensed milk, and watches and clocks. Germany's large share of Switzerland's trade is due partly to her advantage of situation and partly to the readiness of the German merchant to adapt himself to Swiss trade methods. The American merchants have not shown this adaptability and they have been furthermore hindered by the lack of direct trade communications with Switzerland, almost all of the commodities purchased from the United States in Switzerland reaching that country by way of German or other importing firms. S. imposes duties on imports. Her free list includes such articles as fertilizing materials, garden vegetables and other food products, grass, hay, straw, metallic ores, etc. The foreign traders living in Switzerland are treated in all essential respects in the same way as citizens of the country. The monetary unit is the franc, worth in United States currency 19.3 cents. Nominally S. has the double standard of value, being a member since 1865 of the Latin Union (q. v.). The Swiss federal assembly decides how much gold and silver shall be coined, regulating the issue to conform to the treaty. The coinage of gold was made free and unlimited by the law of Sept. 7, 1889. Paper money is issued by banks under the control of the several cantons and the notes are redeemable in gold or silver.

Government.—Hitherto, the Swiss have been very much split into distinct communities by the great mountain-chains which separate the cantons. One of the results has been the weakness of the central power. Each valley has been intrusted with the making of its own laws, and the management of its own local affairs. The cantons are, in fact,

to this day in a great measure separate states. They are divided into two classes, absolute democracies and representative democracies. In the former the chief power belongs to the *landesgemeinde*, an assembly of the whole adult male population, which meets once a year, to pass laws, and to regulate the taxes and expenditure of the canton. Uri, the Unterwaldens, Appenzell, and Glarus have constitutions of this kind. In the Grisons and the Valais, the people may be said to possess similar powers, as all measures must be approved of by them. In the other, the representative cantons, a great council is elected by the people, and to it are deputed most of the powers of the *landesgemeinde*. These local assemblies produce a remarkable effect on the Swiss people. Their debates have an importance far beyond that of an English town-council, or even of a colonial parliament, for their power is infinitely greater, and the population are more immediately interested in them. To the interest they excite is no doubt to be attributed in a great degree the intelligence and public spirit of the Swiss. Their greatest disadvantage lay in the power they formerly had to levy war against each other, and to resist the general government in conducting the foreign policy of the country. But these defects have been to a great extent remedied by the constitution of 1848, which forms the basis of the present constitution, which dates from 1874. It handed over the control of the army, the conduct of foreign affairs, the settlement of disputes between the cantons, and the management of the police and post-office, to a federal assembly (*bundesversammlung*) representing all the cantons. How far this assembly is entitled to interfere with the legislative action of the cantons, has not been very distinctly defined, but the tendency of legislation since its formation has been rather to trench than otherwise on their prerogatives. The federal assembly consists of two chambers—1st, the state council (*stände rath*); 2d, the national council (*national rath*). The former is composed of 44 members, 2 representing each canton; the latter, of 135 members, elected by the cantons in the proportion of 1 to 20,000 inhabitants. These bodies depute the executive authority to the federal council (*bundes rath*), consisting of seven members, and holding office for three years. The president is merely one of the council, and he has none of the quasi-royal privileges of the American president. There is also a court called the federal tribunal (*bundes gericht*), which acts as a high court of appeal, and consists of 9 members elected by the federal assembly. Different systems of law still prevail in the different cantons, which to some extent resemble each other, the most of them having grown out of the old German codes. Except in a few frontier cantons, the Roman law has not been much regarded. Until 1874 the law of the Catholic cantons prescribed, for certain offenses, various degrees of corporal punishment, exposure on the pillory, and public penance in the churches; but in that year capital and corporal punishment was abolished throughout the confederation. In 1879, the cantonal governments were granted the right to restore capital punishment. There are no titles of Swiss origin, families possessing such distinctions deriving them from abroad. There is no standing army in Switzerland, but every citizen is obliged to serve as a soldier, and military drill is taught at all the schools. See ARMIES. MODERN.

Language, Religion, and Education.—In the sequestered valleys of the Grisons, two-thirds of the population still speak a Latin dialect known as the Romaunsh; Italian dialects have penetrated up the valleys of Ticino; French patois has invaded western Switzerland, by the Rhine and the valleys of the Jura, to Laufen, the frontier of Soleure, lake Morat, the Upper Saane, and Siders in the Valais. In the rest of Switzerland the dialects are German. In no country is elementary instruction more widely diffused. Parents are compelled to send their children to school, or have them privately taught, from six to twelve. There are universities on the German model at Basel, Bern, and Zürich, and academies on the French plan at Geneva and Lausanne.

History.—Switzerland was in Roman times inhabited by two races—the Helvetii, supposed to have been Celts, on the north-west; and the Rætians (of whose origin we know nothing) on the south-east. After the conquest of Gaul, both races adopted the language and habits of Rome. When the invasions took place, the Burgundians settled in western Switzerland; while the Alemanni, another Germanic tribe, took possession of the country east of the Aar. A third Teutonic people, the Goths, entered the country from Italy, and took possession of the country of the Rætians, which nearly corresponded with the Grisons. The Burgundians adopted Christianity in the end of the 5th c.; the Helvetii retained their old pagan creed until the 7th c., when they were converted by Irish monks, who founded abbeys and churches, which survive to our own time. Switzerland, in the early part of the middle ages, formed part of the German empire, and feudalism sprang up in the Swiss highlands even more vigorously than it did elsewhere. During the 11th and 12th centuries, the greater part of Switzerland was ruled on behalf of the emperors by the lords of Zähringen (q. v.), who did much to check civil wars, and to promote the prosperity of the towns. They, however, became extinct in 1218, and then the country was distracted by wars which broke out among the leading families. The great towns united in self-defense, and many of them obtained imperial charters. In 1273, Rudolf of Hapsburg, a Swiss nobleman who had favored the independence of the towns, became emperor. After doing so, he continued the same policy; but his son, Albert I. (q. v.), took another course. He attacked the great towns and was defeated. The leading men of the forest cantons, which for ages had yielded a merely nominal recognition of the empire, and had acknowledged no

feudal superior, met on the Rütli meadow, on Nov. 7, 1307, and resolved to expel the Austrian bailiffs or landvögte. See *TELL*. The war terminated in favor of the Swiss at Morgarten in 1315. Schwyz, Uri, and Unterwalden, with Lucerne, Zürich, Glarus, Zug, and Bern, eight cantons in all, in 1352, entered into a perpetual league, which was the foundation of the Swiss confederation. Other wars with Austria followed, which terminated favorably for the confederates at Näfels (q. v.) and Sempach (q. v.). In 1415, the people of the cantons became the aggressors. They invaded Aargau and Thurgau, parts of the Austrian territory, and annexed them; three years later, they crossed the Alps and annexed Ticino, and constituted all three subject states. The Swiss were next engaged in a struggle on the French frontier with Charles the Bold of Burgundy. They entered the field with 34,000 men, to oppose an army of 60,000, and yet they were successful, gaining the famous battles of Granson and Morat in 1476. In 1481 the towns of Freiburg and Soleure were admitted into the confederacy. In 1499 the emperor Maximilian I. made a final attempt to bring Switzerland once more within the bounds of the empire. He sought to draw men and supplies from the inhabitants for his Turkish war; but in vain. He was defeated in six desperate engagements. Basel and Schaffhausen (1501), and Appenzell (1513), were then received into the confederation, and its true independence began. The abbacy of St. Gall, the cities of St. Gall, Mülhausen, and Bienne became associated states with a vote at the diet. Geneva, Neuchâtel, Valais, and the Grisons, also became associated states, but without a vote.

New troubles sprang up with the reformation. Zwingli began to preach in the beginning of the century, and Zürich, in 1523, adopted his opinions, and was followed by Bern and other cantons of the north. The forest cantons remained attached to the church of Rome. War broke out in 1531 between the Catholics and Protestants, and the former were successful at Cappel, where Zwingli was slain. This victory to some extent settled the boundaries of the two creeds in eastern Switzerland. In 1536, however, Bern wrested the Pays de Vaud from the dukes of Savoy and annexed it to their own territory. In the same year Calvin settled at Geneva, and the reformed doctrines spread throughout western Switzerland. During the thirty years' war Bern, which had become, since the conquest of Vaud, the leading canton, and Zürich, contrived to maintain with great skill the neutrality of Switzerland; and in the treaty of Westphalia, in 1648, it was acknowledged by the great powers as a separate and independent state. At this period the Swiss, in immense numbers, were employed as soldiers in foreign service, and the record of their exploits gives ample evidence of their courage and hardihood. Internally there was great stagnation. The constitution of the larger cantons became more aristocratic, that is to say, the mass of the people lost their power over the governing bodies. In Zürich, Schaffhausen, and Basel the governing councils were elected by the corporations; and in Bern, Freiburg, Soleure, and Lucerne, a few families had acquired permanent rule. At the end of last century there was widespread discontent with this state of matters; but the French revolution broke out, and wars followed, which left no time for its manifestation. In 1798 Switzerland was seized by the French. At the peace of 1815 its independence was again acknowledged. The new confederation was divided into 22 cantons, each of which was represented in a diet, which was appointed to hold its annual meetings alternately at Bern, Zürich, and Lucerne. The old abuses which had crept into the constitutions of the cantons were revived, and representation in most of them became based on property qualifications. Officials, the aristocracy, and the clergy joined to oppose innovations, and succeeded in doing so until 1830, when the French revolution broke out. Armed demonstrations were made against the towns, and universal suffrage was generally conceded. Basel town, however, held out; but the difficulty was settled by the separation of the town and country districts—the former remaining conservative, the latter becoming democratic. Geneva and Neuchâtel retained their old constitutions. The result of the changes was, however, that two-thirds of the whole population were allowed to take part in public affairs. The consequences were not what had been expected by the liberals, who found that they had not yet the means of strengthening the central power. In 1839 at Zürich, where Dr. Strauss had been appointed a professor of theology, a mob of peasants, headed by the Protestant clergy, overturned the government. In Aargau a struggle took place between the liberals and the Ultramontane party, which was settled, after long discussion, by an unsatisfactory compromise. In Valais, where universal suffrage had put power into the hands of the reactionary party, a war took place, in which the latter were victorious. They then ruled with a strong hand, and actually forbade the celebration of Protestant worship within the canton. In Lucerne, the headquarters of the Jesuits, the Ultramontane party acted even more extravagantly; they so persecuted their political opponents that the latter were compelled to leave the canton. These measures caused the greatest discontent. In 1844 a proposal was made in the diet to expel the Jesuits; but that body declined to act. The radical party then determined to resort to force; they organized bodies of armed men, called the free corps, which invaded the Catholic cantons, but they were defeated. Changes favorable to them took place in some of the cantons. The Catholic cantons then formed a league, named the Sonderbund, for defense against the free corps. There was a general clamor for its suppression, but in the diet only 10½ votes were in favor of that measure. The ruling party in Geneva had been with the

majority, and this conduct led to a revolution in that city. One vote was thus gained against the Sonderbund. St. Gall added another; and a majority in the diet in 1847 declared the illegality of the Sonderbund, and decreed the expulsion of the Jesuits. In the war which ensued between the federal army and the forces of the Sonderbund, the former were victorious at Freiburg and Lucerne. The leagued cantons were made liable in all the expenses of the war, the Jesuits were expelled, and the monasteries were suppressed. An attempt was made by diplomatic notes to intimidate the Swiss government, but the revolution of 1848 broke out and prevented further interference. In the same year the radical party, convinced of the necessity of a more powerful central government, carried the constitution of 1848, of which we have already taken notice. Since then the most important event which has taken place in Switzerland was a rebellion against the king of Prussia as prince of Neuchâtel. The canton was declared a republic, with a constitution similar to that of the other Swiss states. The king of Prussia protested vainly, and now retains only the bare title of prince of Neuchâtel. The new constitution of 1874 transferred much power from the cantons to the federal body. In 1888, a diplomatic difficulty arose with Germany owing to the fact that German socialists were harbored in Switzerland. The Swiss government refused to accept the dictation of Germany and took measures to mobilize its forces and strengthen its fortifications, in consequence of which, and because of the moral support given to Switzerland by other governments, the German foreign office adopted a more conciliatory attitude. In 1891, the six hundredth anniversary of the "everlasting league" first entered into by the three forest cantons in 1291, was celebrated by the Swiss with great enthusiasm. See Baker, *The Model Republic* (1895).

SWITZERLAND, a co. in s.e. Indiana, adjoining Kentucky; bounded e. and s. by the Ohio river; about 230 sq.m.; pop. '90, 12,514. Co. seat, Vevay.

SWORD, a well-known weapon of war, the introduction of which dates beyond the ken of history. It may be defined as a blade of steel, having one or two edges, set in a hilt, and used with a motion of the whole arm. Damascus and Toledo blades have been brought to such perfection that the point can be made to touch the hilt and to fly back to its former position. In last century, every gentleman wore a sword; now the use of the weapon is almost confined to purposes of war. In the British army, all officers and sergeants, with troopers of cavalry, wear swords for cutting and thrusting. In the navy, all officers wear similar swords; and the men in time of action, heavy-backed swords, called *cutlasses*. In the French service, nearly all troops wear a combination of the sword with the bayonet, called a sword-bayonet.—For various sorts of swords and their uses, see RAPIER, CUTLASS, BROADSWORD, SCIMITER, SABER, etc.; FENCING. See R. F. Burton's history of *The Sword* (1888).

SWORD-FISH, *Xiphias*, a genus of fishes of the family *scomberidae*, having the upper jaw remarkably elongated and compressed, in the form of a sword or dagger. The body is rather of a long shape, and covered with very small scales. There are no teeth. There is one long dorsal fin. There are no finlets. The ventral fins are wanting. The sides of the tail are very strongly keeled. The tail-fin is large and forked. Only one species is known, *X. gladius*, plentiful in the Mediterranean, and in the warmer parts of the Atlantic; sometimes, but rarely, seen on the British coasts. It is bluish black above, and silvery white on the belly, the one color passing gradually into the other. It is highly esteemed as an article for food, especially when young. It is harpooned by the fishermen of the Mediterranean, and is powerful enough to drag a boat about for many hours after being struck. It has been said to attack the whale with its sword, but this is extremely improbable. Its food consists in great part of squids and cuttle-fish. The use of the sword is unknown. Instances not unfrequently occur of ships' bottoms being perforated by the sword of the sword-fish, but there is no good reason to think that an intentional attack is ever made.

SYBARIS, and **CROTON** or CROTONA, two celebrated Greek colonies in Magna Græcia (q.v.). The former—founded 720 B.C., by Achæans and Trœzenians—was situated in the s. of the Lucanian territory, between the rivers Crathis (*Crati*) and Sybaris (*Cos-cili*) about 3 m. from the Tarentine gulf; and the latter—founded 710 B.C., by Achæans—about 50 m. s.s.e. on the coast of Bruttium. All that is certainly known concerning these cities before the destruction of the former is, that they both rapidly increased in size, wealth, and power, extending their dominions across the peninsula, and founding other colonies, at the same time preserving the most friendly terms with each other. Sybaris is said to have been 6 m. in circumference, and Croton 12 m.; the former being notorious for the excessive and fastidious luxury of its inhabitants (hence the term Sybarite), and the Crotoniates celebrated for the perfection they reached in athletic exercises—the famous athlete, Milo (q.v.), having been a native of Croton. Somewhere between 540 and 530 B.C., Pythagoras (q.v.) settled at Croton, and exercised very considerable influence over the aristocratic government. About 510 B.C., a democratic leader, Telys, deposed the oligarchy of Sybaris, banished 500 of the leading citizens, and assumed the tyranny of the city. The banished citizens having taken refuge in Croton, Telys demanded their surrender, and on being refused, declared war against that city. The Sybarites, with an army said to have amounted to 300,000, met 100,000 Crotoniates, commanded by Milo, at the river Traeis, were completely routed, and their city obliterated by the latter changing the course of the Crathis, so as to sweep

it away. About 443 B.C., Thurii was founded near the site of Sybaris. After the destruction of Sybaris, Croton appears to have gradually declined, suffering much from internal convulsions (see PYTHAGORAS), as well as from the disasters which befell it in its wars with the Locrians, Rhegians (480 B.C.), and Bruttians, and also in those of Dionysius (q.v.) of Syracuse and Pyrrhus (q.v.). Its ruin was completed in the second Punic war; and although, in 194 B.C., it was colonized by Roman citizens, it never again rose to be a place of any importance. Croton, in the time of Herodotus, and at a later period, was famous as a medical school.

The modern town of Cotrone, standing very near the site of the ancient town, had a pop. (1881) of 6484.

SYBEL, HEINRICH VON, German historian, was born in Düsseldorf, Prussia, in 1817; studied under Von Ranke at the University of Berlin and took his degree at Bonn, where he subsequently became Extraordinary Professor, and in 1845 Professor of History at Marburg. In 1847, he was elected to the Hessian legislature, and later to the Diet of Erfurt. In 1856 he was invited to Bavaria by the king, and became a member of the Academy of Sciences in Munich. In 1861, he was called to the chair of history at Bonn, whence he was sent to the Prussian House of Deputies, and in 1866 to the Constituent Diet of the North German Confederation. He became director of the Royal Prussian Archives in 1875, a post that gave him the amplest facilities for prosecuting his historical researches. His great works are, *A History of the First Crusade* (1841), *A History of the French Revolution, The Rising of Europe against Napoleon I.* (1860), and *The Founding of the German Empire by William I.* (7 vols. Munich, 1889-94), which was translated into English (1891). He died in 1895.

SYCAMINE, a tree mentioned in Scripture, and supposed to be the black mulberry (q.v.).

SYCAMORE, or SYCOMORE, *Sycomorus*, a genus of trees of the natural order *moraceæ*, regarded by many botanists as a mere sub-genus of *figus* (see FIG), and differing from the true figs only in the elongated, straight, thickened, and club-shaped stigma. The species are chiefly African, but the geographical range extends also into the w. of Asia. Some of them attain a large size and a great age. The EGYPTIAN SYCAMORE (*S. antiquorum* or *figus sycamorus*), supposed to be the sycamore of the Bible is a large tree, very abundant in Egypt and in some parts of the w. of Asia, often planted near villages for the sake of its shade, its wide-spreading head sometimes covering a space 40 yards in diameter. The figs are top-shaped, and grow in clustered racemes on the trunk and oldest branches. They are sweet, well-flavored, and somewhat aromatic.

The sycamore tree of Britain is a species of maple (q.v.). In some parts of North America the same name is given to the plane (q.v.) of that country, *platanus occidentalis*.

SYDENHAM, a suburb of London, county of Kent, 7 m. s. of London. It has become of world-wide celebrity in connection with the Crystal Palace (q.v.), which was erected here in 1854, chiefly from the materials of the building of the great exhibition (1851). Pop. '91, 34,162.

SYDENHAM, THOMAS, a great English physician, was born of good parentage, in 1624, at Winford Eagle, Dorsetshire, and was educated at Magdalen hall, Oxford. According to the well-known French surgeon, Desault, he afterward studied at Montpellier. He graduated at Oxford as bachelor in medicine in 1648. Through the interest of a near relative, he obtained a fellowship of All Souls' college, and there continued to prosecute his medical studies. He left the university without taking a doctor's degree, which, indeed, he did not obtain till some time afterward at Cambridge. He settled as a practitioner at Westminster, and practiced so successfully that, when only 36 years of age, he already enjoyed the reputation of being one of the first physicians of the period. In his later years he was much afflicted by gout, which at length carried him off on Dec. 29, 1689. He was buried in St. James's church. Sydenham was not profoundly accomplished as a man of science; even in his own age, deficient as it was in the advanced development to which the researches on which medicine is based have now attained, he was inferior to several of his contemporaries; but in sagacity of observation and accuracy of diagnosis, he was unsurpassed. His skill and his philosophic cast of mind secured him the admiration and friendship of Locke; and his contributions to the literature of his profession received the praise of Haller and Boerhaave. His writings have been often republished both in England and on the continent, the edition entitled *Opera Medica*, which appeared at Geneva in 1716, being the best. Fevers were the department of medicine on which he first bestowed his attention; and before he had been many years in practice, he published, in 1666, his celebrated treatise entitled *Methodus Curandi Febres Propriis Observationibus Superstructa*. This was afterward reprinted in 1675, with the observations accumulated in the interval. His treatment of the then destructive malady of small-pox was especially felicitous, substituting, as he did, for the stimulating regimen in vogue, the antiphlogistic method of cool air and salines.

SYDNEY, the capital of New South Wales, and the oldest city in Australia, is situated on the southern shores of Port Jackson, in lat. 32° 52' s., long. 151° 13' e. The first party of British settlers that reached New Holland were landed at Botany Bay on Jan. 20, 1788. The spot which they here selected being found ineligible, it was abandoned a few days afterward, and the infant settlement was transferred to a point about 7 m. further to the n., to the place where Sydney now stands. The choice of the new locality

was chiefly determined by the circumstance of a stream of fresh water being found there, flowing into the deep inlet known as Sydney Cove, one of the numberless bays into which the basin of Port Jackson is divided. This last-mentioned magnificent expanse of water, completely land-locked, and admitting vessels of the largest size, extends for some 20 m. inland, ramifying in every direction. Its bold and rocky shores present a succession of picturesque and beautiful landscapes. The cliffs which form the general outline of the harbor often rise to a height of from 200 to 250 ft. In other points, the coast presents a lower level, consisting of a series of terraces and smooth sandy beaches. Perhaps there are few positions on the habitable globe more obviously suitable for the foundation of a great metropolis. Situated at a distance of about 8 m. from the sea; the whole bay round which it is built forms a fine harbor, where the largest vessels can safely anchor. The narrow entrance of Port Jackson — through what is called the "Heads" — might easily be made inaccessible to any hostile fleet; whilst the central position of Sydney makes it necessarily the permanent emporium of the greater number of the British dependencies in the southern hemisphere. The immense coal formation of east Australia extends n. and s. for some 500 m., with a breadth of from 80 to 100 miles. Sydney stands nearly in the center of this great carboniferous basin; and at various points within a radius of from 30 to 100 miles, large quantities of coal are raised for colonial consumption as well as for export. The sandstone rock upon which the city is erected affords a valuable material for building.

Since the abolition of transportation, the growth of Sydney has been rapid, the pop. in 1862 amounting to 93,596, and in 1895 to 408,500 (est.), including the suburbs. For many years Sydney enjoyed a monopoly of the commerce of these antipodean regions. It has now formidable rivals in Melbourne, Adelaide, and the settlements of Queensland. It must, however, continue the exclusive outlet for the productions and commerce of extensive pastoral and mineral districts on the n.w., w. and southwest. The eastern shore of Darling harbor has its frontage entirely occupied with wharves and quays.

The streets in the older parts of the town are narrow and irregular; in the newer portions care has been taken to avoid these defects; and several of the modern streets, from their breadth and the size and style of the buildings, are not behind those of the principal towns of Europe. The shops, warehouses, and private buildings in George and Pitt streets present long and compact lines of well-built stone edifices, often assuming a very ornate and ambitious style of architecture. The chief thoroughfares are paved, and a system of underground drainage has been carried out at a cost of nearly half a million sterling. Plans have been concluded to bring water from a point on the Nepean river, 63 m. distant, to a large reservoir at Paramatta. A sewer is in process of construction in which all sewage will be conducted to the ocean shore. There are fine botanical gardens, and a number of public parks. The Fitzroy dry-dock, originally intended for vessels of the royal navy, can take in vessels of the largest size. Lately steps have been taken to put the city in a state of defense, and forts and batteries armed with powerful Armstrong guns have been erected. The climate of Sydney is, upon the whole, temperate and healthy.

Among public buildings, by far the most important edifice, not only in Sydney, but in the whole of the Australian settlements, is the university, which stands on a commanding height, and in the center of a domain of about 150 acres. The principal façade is 500 ft. in length, and is flanked at its western end by the great hall, the proportions of which are such that, were it in England, it would rank as the third in point of size. Lectures are delivered daily during each term on classics, logic, history, chemistry, natural and experimental philosophy, and jurisprudence. The museum contains a collection of Greek, Roman, and Egyptian antiquities presented by the former chancellor, Sir C. Nicholson. There are two suffragan colleges in connection with the university — that of St. Paul's, belonging to the church of England; and St. John's, erected under the auspices of the Roman Catholic community. The university is incorporated under an act of the colonial legislature and by royal charter. It is only empowered, however, to confer degrees in arts, law, and medicine; and, so far as the university is concerned, instruction is limited to purely secular teaching. Its degrees rank with any of the English universities. The religious training of the pupils is left to the affiliated colleges. The metropolitan cathedral of St. Andrew is a handsome building in the later perpendicular style of architecture. Many of the churches, upward of 120 in number, belonging to different religious denominations, are tastefully designed. Among the buildings devoted to secular purposes, the most imposing and effective, in point of size and architectural design; are the residence of the governor, the museum, the exchange, the custom-house, the town-hall, the new post-office, and the public grammar-school. The neighborhood of Sydney, with every nook in the adjacent bays, is studded with elegant villas and snug cottages, surrounded by their park-like grounds, and gardens of orange trees, bananas, and numberless semi-tropical plants unfamiliar to the English eye of the newly-arrived immigrant. There are numerous manufactories of wagons, glass, pottery, boots and shoes, railroad manufactures, carriages, stoves, tobacco, and there are distilleries and breweries. Sydney has theaters, several mechanics' institutes, a large hospital for the sick, an orphan asylum, and other charitable and benevolent institutions, all liberally endowed and supported by public grants or private munificence. There are a number of suburbs: Balmain in the w., Newton, Redfern, Marriekville and Waterlow in the s., Paddington, Randwick, Woolhara and Waverley in the e. The more fashionable suburbs are those in the eastern portion.

SYDNEY, a seaport town of Nova Scotia, on the e. part of the island of Cape Breton, and formerly capital of the colony of Cape Breton; the terminus of the intercolonial railroad; 285 m. n.e. of Halifax. It is on one of the finest harbors in the world, with an excellent entrance, on the s. side of which is a lighthouse with a fixed light 160 feet above the sea. The town has a railroad connecting it with the noted Bridgeport coal mines, where the coal vein is 9 feet thick, and has considerable trade with Newfoundland and the islands of St. Pierre and Miquelon. There are several churches, branch bank, masonic hall, hotels, sash and door factories, court house and jail, weekly newspapers, and numerous stores. The town and harbor constitute the North American station of the French navy. Pop. '91, 2435.

SYDNEY, ALGERNON. See **SIDNEY**.

SYENE. See **ASSOUAN**.

SYENITE, a granitic rock found near the city of Syene, in Egypt. It is composed of quartz, feldspar, and hornblende, and differs from true granite in having the mica replaced by hornblende. The feldspar is generally red (sometimes it is found of a white color), and the hornblende gives a mottled red and dark green color to the rock.

SYKES, GEORGE, b. Del., 1822; graduated at West Point, 1842; commissioned in the infantry and served in the Seminole and Mexican wars, behaving with great gallantry at Cerro Gordo. He was afterward employed on the frontier, and in 1861 was in Texas with rank of captain. He was present at Bull Run, and in the Virginia campaign in command of regular troops, and also at Antietam, Fredericksburg, Chancellorsville, and Gettysburg; and was brevetted maj. general. In 1866 he was mustered out of the volunteer service, and became a col. in the regular army. He d. 1880.

SYKES, OLIVE (LOGAN), b. New York, 1841; at the age of 13 made her debut on the stage in Philadelphia; wife of Edmund A. Delille, 1857-65, went to Europe in 1857; was educated in England, and contributed to English and French papers. In 1864 she appeared at Wallack's Theatre, New York, in *Eveleen*, a play of her own composition; retired from the stage in 1868, and appeared on the platform as a lecturer on woman's rights, pursuing her former calling of newspaper correspondent and magazine writer. In 1871 she became the wife of William Wirt Sykes (d. 1884), U. S. consul at Cardiff, Wales. She has published essays and lectures.

SYLLABUB, a culinary preparation, formerly much more used than at present. It consists of sugar and cream flavored with brandy, sherry, and lemon rind and juice, worked into a froth, and served up in that state in glasses.

SYLLABUS, a document published by Pope Pius IX., 1864, condemning as heresies 80 doctrines which it calls "the principal errors of our times," dividing them into 10 sections; the 1st includes pantheism, naturalism, and absolute rationalism; the 2d, moderate rationalism; the 3d, indifferentism and latitudinarianism; the 4th, socialism, communism, secret societies, Bible societies, and other "pests of this description;" the 5th, errors concerning the church and her rights; the 6th, errors concerning civil society; the 7th, errors concerning natural and Christian ethics; the 8th, errors concerning Christian marriage; the 9th, errors concerning the temporal power of the pope; the 10th, errors of modern liberalism. Among the things thus denounced as errors are the principles of civil and religious liberty, and the separation of church and state. The document virtually declares that the pope is infallible; that Romanism has the exclusive right of being recognized by civil governments; that all other forms of religion are unlawful; that the papal hierarchy is independent of all civil authority, and that the Roman church has supreme control over education, literature, and science; with the right to enforce submission to its decrees.

SYLLOGISM, a name expressing a principal branch or department of logic. When we reason, or get at truth by means of inference, we are said to proceed either inductively (see **INDUCTION**) or deductively. Deductive reasoning, when fully and methodically expressed, takes the form called the syllogism. "This thing will sink in water, for it is a stone," is a deductive argument, but not fully stated; the complete form is: "Stones sink in water; this is a stone; therefore, this will sink in water"—which form is called a syllogism. See **LOGIC**.

To a perfect syllogism it is necessary that there should be three, and no more than three, *propositions* (see **PROPOSITION**); these are the conclusion, or the matter to be proved, and two others that are the means of proving it, called the premises. It is also necessary that there should be three, and no more than three, *terms*, namely, the subject and the predicate of the conclusion, and one, called the middle term, which must occur in both premises, being the connecting link for bringing the two other terms together in the conclusion. The *predicate* of the conclusion is called the major term, because it is in its scope the largest of the three; the *subject* of the conclusion is the minor term, as being the smallest in scope. The three terms enter into the premises in this manner: the major term and middle term make one premise, called the major premise; the middle term and the minor term make the minor premise. In the syllogism above stated, the terms are, "a thing that will sink in water" (major), "this thing" (minor), "stone" (middle); the premises are, "stones sink in water" (major), "this thing is a stone" (minor); the conclusion is, "this thing will sink in water."

The form now given, although the regular and fundamental form to prove any affirmative conclusion, is not the only form that an argument may assume. The totality of syllogistic forms is divided into *figures*, and each figure into *moods*, which are the distinct syllogistic forms, the principle of division being as follows: the figure is determined by the position of the middle term, which may be the *subject* of the major premise, and the *predicate* of the minor (1st figure), the *predicate* in both (2d figure), the *subject* in both (3d figure), the *predicate* of the major and the *subject* of the minor (4th figure).

The word "figure" is borrowed from rhetoric, where it means a departure from plain and ordinary speaking, as metaphor, hyperbole, etc. But, as remarked by Hamilton, only the last three of the foregoing enumeration should be called "figures." The first should be considered as embracing the regular forms of reasoning, and the others as properly figures—that is, forms more or less inverted, irregular, or unnatural, although still correctly representing reasonings that actually occur. These forms may be all *reduced* to forms in the 1st figure; their inversions or distortions being, as Hamilton would say, *redressed*, or restored to the primitive or fundamental type, namely, the syllogisms of the 1st figure.

The 4th figure did not belong to the original scheme of Aristotle, and it is usually considered as both unnatural and unnecessary, being only an awkward inversion of the first. There would then be the natural or standard syllogisms (the 1st fig.), and two sets of figurative departures from them (2d and 3d figs.).

The syllogisms of each figure are said to differ in *mood*, or according to the *quality* and the *quantity* of the propositions—that is, according as these are affirmative or negative (quality), universal or particular (quantity).

The entire scheme may be presented as follows: The symbols used are P (predicate of conclusion), major term; S (subject of conclusion), minor term; M, middle term. The general type of the first figure or standard is:

M is P.
S is M.
S is P.

When the quality and the quantity of the propositions are expressed, there arise four syllogisms of this form—two affirmative, and two negative:

All M are P.
All (or some) S are M. } *Barbara, Darii.*
All (or some) S are P.

All matter gravitates.
All (or some) air is matter.
All (or some) air gravitates

No M is P.
All (or some) S is M. } *Celarent*
No S is P; some S is not P. } *and Ferio.*

No matter is destructible.
All (or some) air is matter.
No air is destructible; some air is not destructible.

The general scheme of the 2d figure is:

P is M.
S is M.
S is P.

There are four syllogisms in all, which we may take in pairs thus:

No P is M.
All (or some) S are M. } *Cesare*
No S is P; some S are not P. } *and Festino.*

"No destructible thing is matter," etc., as in the last form.

All P is M.
No S is M; some S is not M. } *Camestres*
No S is P; some S is not P. } *and Baroko*

In this figure there is a certain distortion of the previous or regular figure. In the first of the two pairs, the major is, No P is M, instead of the equivalent (1st figure), No M is P. In the first form of the second pair, the minor is, No S is M, instead of the equivalent, No M is S, which should be the major to be regular; the amended premises would then give, in conclusion, No P is S, equal to No S is P.

All matter is extended. }
No mind is extended. } *Camestres.*
No mind is matter.

The last form, with a particular conclusion, is exemplified thus:

All matter is extended.
Some things are not extended.
Some things are not matter.

This is a form technically called *Baroko*, which is one of two that are especially difficult to reduce to the standard forms.

This figure proves only negatives.

The scheme of premises in the 3d figure is

M. P.
M. S.

Six varieties of syllogism come under this figure; we may arrange them in three pairs, the first two pairs having the same major, and the third the same minor:

All M is P.
All (or some) M is S. } *Darapti*
Some S is P. } and
 Datisi.

All planets move.

All (or some) planets are heavenly bodies.

Some heavenly bodies move.

No M is P.
All (or some) M is S. } *Felapton*
Some S is not P. } and
 Ferison.

No solid body is perfectly transparent.

All solid bodies gravitate.

Some gravitating things are not perfectly transparent.

Some M is P; some M is not P. } *Disamis*
All M is S. } and
Some S is P; some S is not P. } *Bokardo.*

The first of the two is merely a standard syllogism (*Darii*), with transposed premises, the second (*Bokardo*) is more complicated, as in the example:

Some men are not fit to rule.
But all men are liable to have dominion.
Some men, liable to have dominion, are not fit to rule.

In the 4th figure,

P is M,
M is S,

there are five syllogisms. The mere forms are enough to quote:

All P are M. }
All M are S. } *Bramantip.*
Some S are P. }

All P are M. }
No M is S. } *Camenes.*
No S is P. }

Some P are M. }
All M are S. } *Dimaris.*
Some S are P. }

No P is M. }
All M are S. } *Fesapo.*
Some S are not P. }

No P is M. }
Some M are S. } *Fresison.*
Some S are not P. }

The reasons why these syllogisms are true, and why no other of 256 possible combinations of propositions can give true conclusions, are certain laws, called the rules of the syllogism, which repose on first principles of the highest certainty.

Mr. Mill has laid down the following fundamental axioms of the syllogism, as stated in its standard forms in the first figure. (1.) "Attributes coinciding with the same attribute, coincide with one another." M, the middle term, coincides with P, the predicate; S, the subject, coincides with M; therefore S and P coincide with one another. (2.) "Any attribute incompatible with a second attribute, is incompatible with whatever that second attribute coincides with." No M is P; M is incompatible with P; but S coincides with M, and therefore it also is incompatible with P.

All the syllogisms of the last three figures are reducible to the first, by conversion of

propositions and transposition of premises, according to the nature of the case. The symbolic name of each syllogism contains instruction for this process, as well as stating the composition of the syllogism. To aid the memory, these symbols are put together in five Latin hexameter verses of very ancient but unknown origin:

"Barbara, Celarent, Darii, Ferioque prioris.
Cesare, Camestres, Festino, Baroko, secundæ.
Tertia Darapti, Disamis, Datisi, Felapton,
Bokardo, Ferison habet, quarta insuper addit
Bramantip, Camenes, Dimaris, Fesapo, Fresison."

The first line gives the standard figure, and states the propositions entering into each syllogism. The three A's in Barbara are three universal propositions. The E, A, E, in Celarent, are a universal negative, a universal affirmative, a universal negative; in Darii, A, I, I, a universal affirmative and two particular affirmatives, etc. In the other figures the commencing letter (C, B, etc.) shows which standard syllogism each is to be reduced to (Baroko to Barbara, Cesare to Celarent, etc.). The consonant *s* means simple conversion of the proposition marked by the preceding vowel; *p* means conversion by limitation, or *per accidens*; *m* signifies the transposition of the premises; *k* occurs in Baroko and Bokardo, and denotes that these are to be reduced by supposing the conclusion false, and then showing that on that supposition Barbara would be contradicted—from which it is inferred that the original form is true.

There are some species of deductive arguments that do not fall under the syllogistic figures. Thus, the major may state a conditional proposition, and the minor affirm the truth of the condition. "If the witness is to be believed, the man is guilty" (major); now "the witness is to be believed" (minor); therefore "the man is guilty." A true conclusion would also be obtained by a minor denying the consequent, "the man is not guilty." It would then follow that the witness (who affirms his guilt) is not to be believed. But no conclusion would follow from either denying the condition, "the witness is not to be believed," or affirming the consequent, "the man is guilty," for, in the first place, the man might be guilty whether this particular witness be credible or not; and secondly, the guilt of the man does not prove the credibility of the witness. This is called the *conditional* syllogism.

Again, the major may be what is called a disjunctive or alternative proposition, from which also inferences may be drawn by supplying certain minors. "This was done by either A or B," now "it was not done by A (or by B);" therefore "it was done by B (or by A)." Should the major be understood to mean that it was done by one, and not by both, there would be two other possible inferences. "It was done by A (or by B);" therefore "it was not done by B (or by A)." There are other disjunctive pairs, as for example: "Either A is B, or C is D;" now "A is not B, therefore C is D," etc. This is called the *disjunctive* syllogism.

A combination of the conditional and the disjunctive makes the *dilemma*. For example:

If A exist, then either B or C exists.
Neither B nor C exists.
Therefore A does not exist.

The following dilemma was given to refute the practice of torturing witnesses: "A person able to endure pain will be likely to utter falsehood under torture; one unable will be equally likely; therefore, a person under torture will be likely to utter falsehood."

A very great enlargement has been given to the doctrine of the syllogism by sir W. Hamilton (see QUANTIFICATION), Prof. De Morgan, and the late Prof. Boole of Cork. They have shown that many more syllogistic pairs can be created, and have invented symbols for the purpose. It is, however, comparatively few, either of the old pairs or of the new, that are assumed by the ordinarily occurring arguments, either in the sciences or in common affairs. By far the most useful part of the syllogism is contained within the limits of the first or standard figure, which shows what premises are to be looked out for to prove any conclusion; namely, some *general assertion* of matter of fact, affirmative or negative (major), and a *particular assertion* that a given thing comes under the subject of the general assertion (minor), and therefore falls likewise under its predicate. When an argument is stated in a puzzling or perplexed form, with perhaps the omission of one of its essential propositions, it is well to know how to supply the suppressed premises, and put the argument into regular order: the truth or fallacy of the reasoning then becomes evident at a glance.

SYLPHS, in the fantastic system of the Paracelsists, are the elemental spirits of the air, who, like the other elemental spirits (q.v.), hold an intermediate place between immaterial and material beings. They eat, drink, speak, move about, beget children, and are subject to infirmities like men; but, on the other hand, they resemble spirits in being more nimble and swift in their motions, while their bodies are more diaphanous than those of the human race. They also surpass the latter in their knowledge, both of the present and the future, but have no soul; and when they die, nothing is left. In form they are ruder, taller, and stronger than men; but stand nearest to them of all the elemental spirits, in consequence of which they occasionally hold intercourse with human creatures, being especially fond of children, and of simple harmless people; they even

marry with our race, like the undines and the gnomes, and the children of such a union have souls, and belong to the human race.

In common usage, the term sylph has a feminine signification, and is applied to a graceful maiden. How this curious change of meaning occurred is not quite certain; but it is probably owing to the popularity of Pope's *Rape of the Lock*, which introduced the term into the world of fashion and literature. For although even in Pope, the sylph that guards Belinda is a *he*, yet the poet so refined and etherealized his spiritual agents, that they soon came to be associated with all our ideas of feminine grace and beauty, and this circumstance may have reacted on the popular idea—always loose and inaccurate—of their character and sex, and brought about the change of gender to which we have alluded. See Paracelsus's *Liber de Nymphis, Sylphis, Pygmaeis et Salamandris et Cæteris Spiritibus* (Basel ed. of Paracelsus's works, 1590).

SYLVESTER, the name of two popes, and of a third who was an anti-pope. The pontificate of the first immediately succeeded that of Melchiades in 314, and is memorable for the great council of Nicæa, in which the heresy of Arius was condemned. Sylvester himself did not attend the council, but sent two priests—Vitus and Vicentius—to take his place. His name is also celebrated in connection with the so-called donation of Constantine to the Roman church, the spuriousness of which (although no doubt had been raised regarding it during many centuries) has long been admitted by critics. He died in 335. Sylvester II., one of the most learned of the mediæval popes, originally called Gerbert, was b. at Aurillac, in Auvergne, early in the 10th century. He was educated in the monastery of his native village; but went early to Spain, where he learned mathematics, and afterward to Rome. He was appointed abbot of the monastery of Bobbio, where he taught with much distinction and success. At a later period he went to Germany as preceptor of the young prince Otho, afterward Otho II.; and ultimately became secretary to the archbishop of Rheims, and director of the cathedral school, which became eminent under his care. The archbishop having been deposed, Sylvester was elected to the archbishopric; but he was afterward set aside, the deposition of his predecessor having been declared invalid. In the year 998, however, he was appointed archbishop of Ravenna, whence he was called to the pontifical throne, in the following year, under the name of Sylvester II. He was a man of rare acquirements for his age. He was an adept in mathematics, and in practical mechanics and astronomy, in which department his attainments acquired for him among his contemporaries the evil reputation of a magician. He is also believed to have been acquainted with Greek, and perhaps with Arabic. Of all his works, which were numerous, his letters (printed by Du Chesne in the *Historians of France*) have attracted most notice from the light they throw on an obscure period.

SYLVESTER, Prof. JAMES JOSEPH, F.R.S. (1814-97), Savilian Professor of Geometry in the University of Oxford. After a distinguished college career he attained the position of Second Wrangler in 1837, but owing to his Jewish origin could not take his degree. While professor at University College, London, he received a call from the Johns Hopkins University, Baltimore. He succeeded (1883) Professor H. Smith in the professorship at Oxford. He was Hon. Fellow of St. John's College. He received in June, 1890, the Hon. LL.D. degree at Cambridge. He has written many sonnets; is the author of *The Loves of Verse* (1870), and the inventor of the "improved pantograph."

SYLVESTER, JOSHUA, b. England, 1563. His life was divided between the somewhat incongruous pursuits of merchandise and poetry, in neither of which did he achieve a distinct success. Of his original works, the human memory retains no trace; but in virtue of the great, though fleeting popularity obtained by his English version of the *Divine Weeks and Works of Du Bartas*, from which Milton is thought to have derived some hints, he lives in literary history as a sort of *nominis umbra*. He died in 1618.

SYLVIADÆ, a family of birds, of the order *insectores*, and tribe *dentirostres*, including a very great number of small species, among which are many of the birds most noted for sweetness of song, while some of this power is possessed by almost all the family, so that the name *warblers* is often used as synonymous with sylviadæ. The bill is sharp, slender, straight, and rather compressed toward the tip; the wings moderately long; the legs slender. To this family belong the nightingale, the blackcap, numerous species known by the name of warbler, the redbreast, redstart, wheatear, whitethroat, stonechat, whinchat, golden-crested wren, hedge-sparrow, etc. The sylviadæ are diffused over all parts of the globe.

SYMBOLIC BOOKS, in the language of the church, is a phrase that signifies the same as creeds and confessions (q.v.). The name is derived from the Greek *symbolon*, a sign or mark by which anything is known—a creed being the distinctive mark or watchword of a religious community.

SYMBOLISM. The name given to a curious principle adopted by a school of modern French poets, who affect to set forth their sentiments and meanings, not directly, but in a sort of obscure simile or allegory. Thus a poet depicts a house in which funeral rites are going on, while the pall is laid over the furniture. This is supposed to symbolize the death of poetry and the substitution of music in its place. The extreme symbolists complicate their allegories with what they call "poetic instrumentation"—the theory that the syllables of the French language evoke in us the sensation of different colors and consequently (a beautiful *non sequitur*!) the *timbre* of different instruments. It

is unnecessary to say that no symbolism is wholly comprehensible to any but its own originator, and that the whole theory is morbidly unreal, belonging to the epigene sect known in Paris as the *décadents*. The chief symbolists are Hector Mallarmé, Arthur Rimbaud, Gustave Kuhn, and especially Paul Verlaine. See George Moore's *Confessions of a Young Man*, pp. 51-55 (Amer. ed. 1890), and Nordau's *Dégénérescence* (Eng. trans. N. Y. 1894).

SYMBOLS OF THE EVANGELISTS. See EVANGELISTS, SYMBOLS OF THE.

SYME, JAMES, was born in 1799, in the county of Fife, and received a thorough education in art and medicine, in the University of Edinburgh. In his 19th year he began his anatomical studies under Liston, who appointed him his demonstrator. From 1825 to 1832 he lectured on surgery in the Edinburgh School, and, while generously refusing to lecture in opposition to his old master in the Edinburgh Infirmary, he established a hospital at his own expense, where he delivered a clinical course for four years. In 1831, appeared his well-known treatise on *The Excision of Diseased Joints*; and in 1832, his *Principles of Surgery*, which has since gone through many editions, and which has established his reputation as a teacher of the first rank. In 1833, he was elected to the chair of surgery in the university of Edinburgh, which he filled with the highest distinction. In 1847, he gave up his Edinburgh chair to fill that vacated in London by the death of Liston; but collegiate misunderstandings induced him, after six months, to return to Edinburgh. As an operator, Mr. Syme had no superior; as a teacher, he had no equal. His innovations in the practice of his art were characterized by so much ingenuity, controlled by scientific caution, that they were adopted by all really great surgeons. The best of his pupils, who are numerous, and scattered over every quarter of the globe, have been heard to declare that their soundest ideas in surgery are derived from Syme. Besides the works already named, he was the author of valuable treatises on diseases of the rectum; on the pathology and practice of surgery; on the urethra and *fistula in perineo*; on incised wounds, etc. He died June 26, 1870.

SYMMACHUS, Q. AURELIUS, a distinguished Roman orator, scholar, and statesman who flourished toward the close of the 4th c., was educated in Gaul, and after holding several lesser offices, became prefect of Rome (384 A.D.). Seven years later he was raised to the consulship. The date of his death is unknown, but we know that he was alive in 404 A.D. The character of Symmachus is a very fine one. A sincere pagan in an age when classic paganism was almost extinct, he proved in his own person a pattern of its choicest virtues, and manfully, if in vain, strove to regain for it a place of honor in the state. Symmachus's extant writings consist of ten books of letters (*Epistolarum Libri X.*) and the fragments of nine orations. The former were published after his death by his son, and contain not a little that is valuable in relation to the history of the period; but the style is in general a slavish imitation of Livy. The best editions of the epistolæ are those of Scioppius (Mainz, 1608) and Seeck (Berlin, 1883). The fragments of the orations were first discovered by Cardinal Mai in a palimpsest of the Ambrosian Library, and were first published at Milan in 1815; afterward, with some additions, at Rome in 1823, in *Scriptorum Veterum Nova Collectio*. See Morin's *Etude sur la Vie et les Ecrits de Symmaque, Préfet de Rome* (Par. 1847); and Seeck's edition (Berlin, 1883).

SYMMES, JOHN CLEVES, 1780-1829, b. N. J.; in 1802 he became an ensign in the U. S. army, and served with credit in the war of 1812. After the close of the war he became a resident of Newport, Ky., and spent his time in studying, writing, and lecturing on scientific and geographical subjects. He acquired some notoriety by his extraordinary theory that there is an opening at each of the poles, leading into the center of the earth, which he thought was hollow, and capable of habitation. He wrote *Theory of Concentric Spheres* (1826).

SYMMETRY OF ORGANS. Throughout the animal kingdom, a symmetry of organs very generally prevails in the two sides of the body. This is the case in man and in all the *vertebrata*; more perfectly, however, in the external than in the internal organs, the two sides of the body presenting great diversities in the circulating, digestive, and other systems. Even the external organs, although similar on the two sides, are never perfectly so. On comparing the two hands, for example, the veins of the one will be seen to differ from those of the other. In *mollusca*, the symmetry of the two sides sometimes exists, and is sometimes entirely lost, the one side remaining undeveloped in the growth of the animal. In the *articulata*, the symmetry is in general as perfect as in the *vertebrata*, and in the internal structure even more so. In the *radiata*, the whole type is very different, and a very different kind of symmetry appears, not with reference to two sides, but to the rays into which the body divides.

In the vegetable kingdom, a symmetry is found, more or less perfect, but never completely so, between the two sides of leaves, fronds, etc. In flowers, a symmetry appears in the regular distribution of sepals, petals, stamens, etc., around the center of the flower; and even in the buds of those flowers which least exhibit it when fully blown.

SYMONDS, JOHN ADDINGTON, was born at Bristol, England, October 5, 1840. He was educated at Harrow School, and Balliol College, Oxford. In 1862, he received a fellowship in Magdalen College, Oxford; but for many years on account of ill-health he resided at Davos-platz, in Germany, and devoted himself wholly to literature. Among his principal works are, *Introduction to the Study of Dante*; *Studies of the Greek Poets* (2 vols.); *Sketches in Italy and Greece*; *Renaissance in Italy* (seven volumes, completed in 1896); *Shelley and Sir Philip Sidney* in the *English Men of Letters Series*; the

article on *Italian History* in the *Encyclopædia Britannica*; *Many Moods* and *New and Old* (volumes of poems); *Animi Figura* (sonnets); *Italian By-ways*; and *Walt Whitman* (1893). Died 1893.

SYMPATHETIC INK. See INK.

SYMPATHY (Gr. *sympâttheia*, fellow-feeling) may be defined as the assumption by different individuals, or by different parts of the same individual, of the same or an analogous physiological or pathological state at the same time or in rapid succession. The late Dr. Todd (art. "sympathy" in the *Cyclopædia of Anatomy and Physiology*) divides all the examples of sympathy which are included in the above definition into three classes; first, sympathies between different individuals; secondly, those which affect the mind, and, through it, the body; and, thirdly, those which are strictly organic.

As examples of the *first class* may be mentioned the readiness with which the act of yawning is induced in a company, if a single person begins to yawn; the facility with which hysterical convulsions are induced in a female hospital ward by a single case; the fascination of its prey by the serpent, apparently by the power of the eyes; the similar power exerted by so-called electro-biologists and mesmerists, and by which some men can control even the fiercest carnivora. Of these sympathies the only explanation that can be given is that suggested in the article on Animal Magnetism (q.v.). As examples of the *second class*, the following cases may be adduced: certain odors—as of strawberries, mutton, cats, and other most diverse objects—will induce fainting in some people; the smell of a savory dish will excite a flow of saliva in the mouth of a hungry person; and the excitement of the emotions of pity will produce a copious flow of tears. In these cases, an affection of the mind is a necessary link, but why that affection of the mind should produce its peculiar effect, is a question not easily answered; but it is plain that the portion of the nervous center which is affected in such cases, must have a direct influence upon the parts in which the sympathetic phenomena appear, through commissural (or connecting) fibers, or the continuity of its gray matter with that of the center from which its nerves immediately spring. Examples of the *third class* occur in the pain in the knee which arises from disease of the hip-joint; the pain in the right shoulder from disease of the liver; the pain over the brow on taking a draught of iced water into the stomach; the various spasmodic affections connected with intestinal irritation, or the irritation of teething; the vomiting that occurs on the passage of a biliary or renal calculus, etc. All these cases may be more or less satisfactorily explained by the known laws of the sensory and motor nerves. In some of these cases the explanation, however, cannot be regarded as altogether complete. For example, the pain over the brow from the ingestion of cold water or ice into the stomach, may be referred to irritation of the gastric branches of the pneumogastric nerves communicated in the medulla oblongata to the fifth nerve; but why the irritation should be confined to the frontal branch of the first (or ophthalmic) division of the fifth nerve, we are utterly unable to explain.

SYMPHONY, in music, a word used in two different senses: 1. The instrumental introduction and termination of a vocal composition, sometimes called *ritornello*; 2. A composition for a full orchestra, consisting of from three to six movements. It is for the orchestra what a sonata (q.v.) is for a single instrument; but generally of greater length, and its movements more fully and richly developed, the subjects introduced being worked out in broader masses. The most usual though not unvarying order of movements is a brilliant allegro, ushered in by a slow introduction, an adagio or andante, a minuet with its trio, a short sportive movement called a scherzo, and a lively finale. The symphony is one of the highest of musical compositions, and one in which excellence is rare. Haydn, Mozart, Beethoven, and Mendelssohn are among the few successful composers of symphony; and the nine symphonies of Beethoven are generally acknowledged to be the greatest works of their class. The overture (q.v.) is in form not unlike a symphony, but much shorter; but the terms symphony and overture were at one time used almost synonymously, and several of Haydn's early symphonies are called overtures. At the present day the overture in the composer's score of an Italian opera is called *sinfonia*.

SYMPHYTUM. See COMFREY.

SYMPTOMS (Gr. *sympiptein*, to concur), in medicine, are the morbid phenomena by which the physician becomes aware that derangements of some kind have taken place in the economy; but it requires a mental effort to convert these symptoms into signs of disease. A symptom thus converted into a sign of some special disease or disordered condition, tends to constitute the *diagnosis*, or recognition of the disease. "The interpretation of symptoms," as Dr. Aitken observes, "can only be successful after a close observation of the patient—often prolonged and repeated for more complete investigation—so as to connect the results arrived at with his previous history. The utmost logical acumen is required for the due interpretation of symptoms. The individual value of each ought to be duly weighed; one symptom must be compared with another, and each with all, while the liability to variation of a similar symptom in different cases of a like kind must not be forgotten. Thus only can the nature of a disease be clearly determined, its severity and dangers fully appreciated, its treatment indicated, and the probability of recovery foretold"—*The Science and Practice of Medicine*, 3d ed. vol. i. p. 9. Many

writers, following the example of Laennec, confine the term *symptom* to the phenomena depending on vital properties; while those phenomena of disease which are more directly physical, they call *signs*. We thus have what may be called *physical signs* and *vital symptoms*. The form, size, color, firmness or softness, heat and odor of a part of the body, the sounds which it yields on percussion or disculation, etc., afford *physical signs*; while *vital symptoms* may be exemplified in pain, uneasiness, altered or impaired sensations, spasm, vomiting, the accelerated pulse and hot skin of fever, the state of the tongue and of the alvine and urinary excretions, etc. The term *semiology* (literally, *the theory of signs*) has been given by medical writers to the general study of this subject, which is admirably discussed in Williams's *Principles of Medicine*.

SYNAGOGUE (Gr. = *ecclesia*; Heb. *beth-hakkeneseth*, house of assembly), a Jewish place of worship. The origin of this institution is probably to be traced to the period of the Babylonian captivity, although tradition finds it in the patriarchal times. When, at the time of Ezra, and chiefly through Ezra's instrumentality, the ancient order of things was re-established in Judea, synagogues were established in all the towns for the benefit of those who could not take part oftener than three times a year, or not even as often as that, in the worship of the temple at Jerusalem, and a special ritual of lectures and prayers was instituted. From the time of the Maccabees, we find them even in all the villages; and Josephus, Philo, the New Testament, the Mishna, and the Talmud, constantly allude to them. Common prayer and religious instruction were the purpose for which the people there met. The Sabbaths and feast-days were the principal times on which the faithful assembled in them; and they contributed more than anything else to the steadfast adherence of the people to their religion and liberty as long as there was any possibility of keeping both intact. At the same time they gradually undermined the priestly and aristocratic element that gathered round the temple, its gorgeous worship and kingly revenues. Little is known of any special laws respecting the construction of these buildings, save that the faces of the worshipers should be directed toward Jerusalem (*misrach* = eastward) (see *Mosque*); or that, in accordance with the verse in the Psalms, there should be a slight descent of a step or two on entering it, or that it should stand, if feasible, on a slightly elevated ground, or be somehow or other made visible far off. Erected out of the common funds or free gifts of the community, it had also to be supported by taxes and donations. All profane doings were strictly prohibited in it. No eating, drinking, reckoning, and the like, were allowed; and even as to dress and other things of general decorum, the reverence due to the place was enforced as rigidly as possible. It represented in miniature the form of the temple, itself an enlarged type of the tabernacle. At the extreme eastern end was the *Aron hakodesh*, the holy ark, containing several copies of the Pentateuch, from which the periodical readings were chanted. In front of this was the stand of the public reader of the prayers, not far from which was suspended the everlasting lamp (*ner tamid*). On a raised platform in the middle of the synagogue, was the place of the reader or preacher. The women sat separated from the men by a low partition five or six ft. high. The affairs of the synagogue were administered by a board of "ancients" or "elders," at whose head stood a chief or principal (*Rosh hakkeneseth* = *archisynagogos*). This college managed the inner affairs of the synagogue, and had even the power of excommunication. The officiating minister, whose office it was to recite the prayers aloud, was called *sheliach tzibbur*—messenger of the community (*angelos ecclesias*, Rev.). His qualifications were, among others, to be active, to be father of a family, not to be rich or engaged in business, to possess a good voice, to be apt to teach, etc. The beadle, or *chazzan*, had the general charge of the sacred place, and its books and implements. He had to present the scroll to the reader, and assist on other occasions. During the week-days, he had to teach the children of the town or village. He too had to be initiated by a solemn imposition of hands. This name of *chazzan*, however, at a later period, came to designate the officiating minister, and it has retained that meaning until this day. Almoners or deacons, who collected or distributed the alms, possibly the same as the *batlanim* or "idle men," whose office in relation to the synagogue cannot be exactly determined now, but who had always to be ready for the purpose of making up the requisite number of *ten* worshipers, were further attached to the general body of officials. Respecting the prayers used, we have spoken under **LITURGY (JEWISH)**. As to the time of daily worship, we may observe that the third, sixth, and ninth hours of the day were the times appointed for it, and the more special days were the Monday and Thursday, when the judges sat, and the villagers came to town; and the Saturday, on which the forms of some of the prayers were altered according to the occasion.

On the connection between the Jewish synagogue and the Christian church, and their respective rites and modes of worship we cannot here enlarge. Thus much, however, we may say, that it is obvious to the most superficial observation that the principal practices of the latter belong, with certain modifications, to the former; and it has been conjectured that even the melodies of certain hymns still sung in the Roman churches are to be traced to the temple and the synagogues. It is, moreover, well known that the early Christian churches were entirely organized after the pattern of the synagogues. As to the judicial power exercised by the officers of the synagogue, we refer to **SANHEDRIM**. They had, there can hardly be a doubt, a kind of authority with

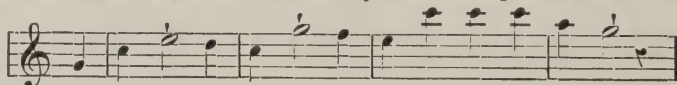
regard to religious transgressions ; but how far they were allowed to carry this authority is not so easily determined. Modern synagogues differ but in some minor points—additional prayers and the like—from what we gather to have been the nature of those at the time of Christ, save that there are no more elders, but a simple board elected from the community, without any authority beyond that of, perhaps, a board of church wardens, and that the chazzan, as we said, has now the functions of the “sheliach.” See JEWS, LITURGY (JEWISH), etc. The languages used in the early synagogues of Palestine and Alexandria were Hebrew, Aramaic, and Greek respectively.

SYNAGOGUE, THE GREAT (*keneseth haggedolah*), an assembly or synod, supposed to have been founded and presided over by Ezra, consisting of 120 men, said to have been engaged in remodeling the national and religious institutions of the Jews after the return from Babylon. The palpable chronological discrepancies that occur in the early accounts about this synod, together with other doubtful points, have led modern scholars to deny its existence completely. But the fact of Josephus not mentioning it avails very little against the positive assertions of the Talmud, and what is still more important, of the Karaites, the professed adversaries of all tradition. True, Ezra, the contemporary of Artaxerxes, can never have taken his place in it together with Zerubbabel and Joshua, who left Babylon under Cyrus, or with Simeon the Just, who lived at the time of Alexander the Great. These, however, are but apparent anachronisms. The tradition never meant anything else than that the institution founded by Ezra, and which lasted up to the time of Alexander, comprised 120 men, of whom Simeon was one of the last. Anyhow, there is absolutely no reason to doubt that Ezra and Nehemiah did a certain amount of work which they could not have done without being assisted by eminent collaborators. It was to this body to which certain vital ameliorations in the administration of justice are ascribed. They developed public instruction, and fixed and enlarged the Mosaic laws by certain rules of interpretation. “Be circumspect in judgment; make many disciples; and erect a fence around the law;” are some of the principal sayings ascribed to them. Above all, it seems to have been the office of Ezra and his coadjutors—the men of the Great Synagogue—to collect, purify, and redact the sacred books as much as in them lay. Whether, however, they really introduced the vowel-points, which have been handed down to us by the Masoretes, instituted the Feast of Purim, sanctioned the Eighteen Benedictions (see LITURGY, JEWISH), etc., is more than doubtful. They certainly disappeared before the Sanhedrim (q.v.) were instituted, but it may be that their legislative functions were no longer needed at that advanced period.

SYNANTHEREÆ. See COMPOSITÆ.

SYNCLINAL AXIS is the line of curve in the trough of a series of beds from which the strata rise on either side. The ridge-curve is called the anticlinal axis.

SYNCOPE TION, in music. Notes which begin on the unaccented part of a measure, and end on the accented, are called syncopated or driving notes. Their effect is to invert the rhythm, and lay an emphasis on the usually unaccented part of the measure, e.g.:



SYNCOPE. See FAINTING.

SYNCRETISM (signifying acting together as Cretans), a term used : I. In ancient times, *politically*, to designate the Cretan custom of disregarding all internal dissensions whenever a controversy with a foreign country occurred. II. In the 16th c., *philosophically*, to denote the efforts made to reconcile opposing systems. III. In the 17th c., *theologically*, first by Pereus in his *Irenicon*, and afterward to describe the views of Calixtus and his followers, who sought to heal the schism in the church by making the traditions of the first five centuries of equal authority with the Bible, and by adopting the Apostles' creed as the common basis of all Christian denominations and a sufficient definition of true Christianity. The plan was that all holding these tenets should come into peaceful relations.

SYNDIC (Gr. *syn*, with, and *diké*, justice), a name which has at different times and in different countries been given to various municipal and other officers. In Geneva the chief magistrate was formerly called the syndic. The syndics of cities in France, under the old régime, were officers delegated by the municipality as agents or mandatories; the various trading companies in Paris and the university had also their syndics; and in the university of Cambridge the same name is applied to members of special committees of members of the senate, appointed by grace from time to time for specific duties. See UNIVERSITY.

SYNECDOCHE (Gr. literally an “understanding one thing with another”) is a term in rhetoric denoting that mode of expression by which a part is put for the whole, and *vice versa*; as e.g., a door for a house, a sword for any weapon of war.

SYNERGISM (Gr. *synergeo*, to work together with), the name given to a doctrine of theology which teaches that in the work of conversion, the will of man is not wholly

passive, but can co-operate, through consent, with the Divine Spirit. About 1557 the question was hotly discussed by the Protestant theologians Pfeflinger, Flacius, and Strigel, and soon the whole theological world was wrangling over the point. The Wittenberg divines were in favor of, the Mansfeld divines against, synergism. Finally, the *Concodein formel*, in its third article, condemned it.

SYNE'SIUS, b. Cyrene, Africa, about 379, from a rich and noble family; was a philosopher, poet, and Christian bishop. He was a pupil of the renowned Hypatia of Alexandria, afterward studied at Athens, and, returning to Cyrene, lived in retirement. He was sent to Constantinople to solicit aid for the people suffering from famine, and, soon after his return to Cyrene, was converted from paganism by the influence of his Christian wife. In 410, though not baptized, and married, and holding certain doctrines not considered orthodox, he was made bishop of Ptolemais. After baptism and seven months' preparation he entered upon his duties. His works, mostly epistles, treatises and hymns, were collected by Petavius in Greek, with a Latin translation, and published in 1612 and 1640. The hymns have often been published, in several languages. He is supposed to have died about 415.

SYNGE NESIA. See COMPOSITEÆ.

SYNGNA THIDÆ. See PIPE-FISH.

SYNOD (Gr. and Lat., an assembly) in general signifies a meeting, but it is almost exclusively applied to ecclesiastical assemblies for the purpose of deliberating on doctrinal or disciplinary subjects. In church law, several kinds of synods—called also councils (q.v.)—are enumerated: (1) ecumenical or general, of the entire church; (2) national—that is, of the church of an entire nation; (3) provincial—that is, of a province; (4) diocesan, or of a single diocese. Of these, the ecumenical council has been already described. Of the others, little explanation is needed beyond what is conveyed in the names themselves. By the law of the Roman Catholic church, the decrees of a national or provincial synod must be submitted to the pope, and unless confirmed by him, or at least suffered to pass for two years without condemnation, are not held to have force. The diocesan synod is convened by the bishop, and consists of the members of the chapter, the beneficed clergy having the permanent care of souls, and the heads of the communities of regular clergy. Synods of the English church are only held by the authority of the crown. A Presbyterian synod consists of only the ministers and elders within the particular district, generally one elder for each congregation. It is subordinate, however, to the general assembly, when there is a general assembly.

SYNO DIC, the epithet applied to the period which elapses between a planet's appearance at one of the nodes of its orbit, and its return to the same node. See NODES and MONTH.

SYNONYM. When any one of several words will serve to name or express the same thing, that thing is said to be *polyonymous*, or many-named, and the words are called *synonyms* (Gr. names together, or in company). In this wide sense, *man*, *soldier*, *general*, *Frenchman*, might be called synonyms, as they can all be applied to denote the same individual—e.g., Napoleon. See NOUN. But the term is commonly applied in a restricted sense to words having substantially the same meaning, with only slight shades of difference—as *observe* and *remark*. In a settled and matured language, no two words can have exactly the same meaning; in such a case, one of them would be superfluous, and would be silently dropped. Words that were originally identical in application, have become differentiated by usage, each being appropriated to a special variety of the general notion.

The English language abounds in pairs of synonyms like *sharp* and *acute*, of which the one is Anglo-Saxon, the other borrowed from the Latin. It would be difficult to find a case of more exact correspondence of sense than *acutus* in Latin, and *sharp* (Ger. *scharf*) in Teutonic; but *acute* in English has become confined to the metaphorical sense of sharpness of the intellect or of the senses, the only case of its retaining the primary, physical signification being in the technical phrase, an "acute angle." *Sharp*, again, is applied both in the physical sense and also in the metaphorical; but metaphorical *sharpness* is not exactly the same thing as *acuteness*. A "sharp" lad is one quick in apprehension and movement; an "acute" intellect is one having great power of penetration and discrimination; while in a lawyer of "sharp" practice, a reprehensible moral quality is implied.

SYNOVIAL MEMBRANES and FLUID. In every joint in which a considerable range of motion is required, the osseous segments (or contiguous extremities of bones) are separated by a space, which is called the cavity of the joint. The end of each of the bones entering into the composition of the joint is incrustated by a layer of articular cartilage adapted to its form, and the entire cavity of the joint is lined by a delicate membrane, which is termed the *synovial membrane*, which secretes a peculiar viscid matter, termed *synovia*, or *synovial fluid*, for the purpose of lubricating the inner surface. In its microscopical characters, a synovial membrane so closely resembles a serous membrane, that we shall content ourselves with referring the reader to the article on the latter structures. There are, however, certain points of difference, which are fully described in the article "Serous and Synovial Membranes" in *The Cyclopædia of Anatomy and Physiology*. Like

a serous membrane, a synovial membrane is always a closed bag, like the pleuræ, for example, with an attached and a free surface, the latter being smooth and moist. A very simple form of synovial membrane—anatomically known as a *bursa*—is employed to facilitate the gliding of a tendon of a muscle or of the integument over a projection of bone. It consists of a bag connected by areolar tissue with the neighboring parts, and secreting a fluid in its interior. These bags are sometimes prolonged into *synovial sheaths*, which surround long tendons, such as those of the flexor and extensor muscles of the fingers and toes. In deep-seated whitlow (q.v.), when inflammation extends to one of the sheaths, and gives rise to the formation of adhesions, the motion of the inclosed tendon is destroyed, and a permanently stiff finger is the result.

The *synovial fluid*, or *synovia* derives its name from its resemblance to the white of an egg (Gr. *syn*, with, and *oîn*, an egg). It consists of water holding in solution mucin, albumen, extractive matters, fat, and inorganic salts. The analysis of Frerichs shows that the composition and quality of the synovia vary essentially according as an animal is at rest or leads a wandering life.

SYNTAX (Gr. *taxis*, arrangement, *syn*, together) is the part of grammar that teaches the putting together of words for the expressing of thoughts; in other words, it treats of the construction of sentences. The first step is the analysis of sentences—the study of their anatomy and physiology, as it were (see SENTENCE). This important part of the subject is too often altogether overlooked. A clear perception of the mutual relations of the several members of a sentence makes the usual rules of syntax appear self-evident truths, and in most cases superfluous. Most of these rules fall under the heads of (1) concord and government, and (2) order of words or collocation. For details we must refer to special works on the subject.

SYNTAX, FIGURES OF, are intentional deviations from the ordinary construction of words. The principal figures of syntax will be defined in alphabetical order. **ANAPHORA** is the repetition of the same word or grammatical form at the beginning of several successive clauses, as “*without tumult, without arms, without harm or injury the insurrection was quelled.*” Compare the verses written by Virgil, beginning *Sic vos non vobis*. Cicero (Cat. Or-1. 1) affords a good example of this figure in the repetition of *quid*. **ANASTROPHE** is a form of hyperbaton (q.v.), consisting in a transposition of words, as *rolled the thunder for the thunder rolled*, or “*he travels earth around.*” **ANTIMERIA**, a kind of enallage (q.v.), is the substitution of one part of speech for another, as when Virgil speaks of a “people widely king” instead of a “people ruling widely.” **ASYNDETON** (Gr., *a*, neg., *syndeo*, to bind together) is the ellipsis of a conjunction or connecting particle, as *veni, vidi, vici*, I came, I saw, I conquered. **BRACHYLOGY** (Gr., *brachys*, short, *logos*, discourse) is the use of a concise or pregnant mode of expression. So the Romans would say, “the eye of a horse is bigger than an elephant,” i.e., than (the eye of) an elephant. **CHIASMUS** is a cross-wise arrangement of words, where the words of a second and corresponding set are stated in inverse order to those of the first set, as “*Begot by butchers, but by bishops bred.*” Here, though the two sets of words correspond, they stand in inverse order, the verbs being at the extremes and the prepositional phrases in the centre. If the words should be arranged thus,

by joining the corresponding words the Greek letter X (chi) is

but by bishops bred,
formed, whence the name Chiasmus. **ELLIPSIS** (Gr., omission) is the omission of a word or words necessary for the construction of the sentence, but not essential to its meaning. By means of ellipsis conciseness and impressiveness are gained, and accordingly it prevails in proverbs, as “*More haste, less speed,*” or *Ex pede Her ulem*. Ellipses are used in all languages, though of different forms. *The house we saw*, instead of *the house that we saw* is said to be a form of ellipsis peculiar to English. **ASYNDETON** is a special form of ellipsis. **ENALLAGE** (Gr., change) is the substitution of one part of speech, or of one inflectional form of a word, for another. as “*they fall successive and successive rise.*” Here we have an adjective for the adverb *successively*. In “*surely some disaster has befell,*” we have one inflectional form for another, *befell* for *befallen*. In the hands of a great poet, enallage produces a picturesque effect, as Spenser’s “*My beautifullest bride,*” and Shakespeare’s “*Our sometime sister, now our queen.*” **EPANALEPSIS** (Gr., a taking up again) is a recurrence to the same word or phrase after intervening matter. **EPANASTROPHE** (Gr., a turning back) is the repetition of the end of a clause at the beginning of the next, as “*The mouse ran up the clock, the clock struck one.*” **EPIPHORA** is the repetition of a word or words at the end of successive clauses and hence is the reverse of anaphora (q.v.), as *Lælius navus erat, doctus erat*. **EPIZEUXIS** is the emphatic repetition of a word, as

“*Alone, alone, all, all alone,
Alone on a wide, wide sea.*”

HENDIADYS or **HENDIADYOIN** (Gr., *hen*, one, *dia*, through, *duoin*, two) is the use of two co-ordinate words or phrases instead of an expression, in which one qualifies the other grammatically, or in other words, it is the presentation of *one* idea by means of *two* co-

ordinate words or phrases, as a "couch strewn with *purple and tapestry*," i.e., with purple tapestry or *armis virisque*, with arms and men (i.e. armed men). **HYPPALLAGE** is the use of one case for another, the transference of an epithet from its proper subject to another, as *Tyrrhenus tube clangor* (the Tyrrhenian clang of the trumpet) for *Tyrrhene tube clangor* (the clang of the Tyrrhenian trumpet), compare also *arma dei Volcania* for *arma a deo Volcani facta*. **HYPERBATON** is the transposition of words or clauses. The transposition of words is called *anastrophe* (q.v.). An example of hyperbaton of clauses is *valet atque vivit* (he is well and alive) for *vivit atque valet* (he is alive and well). **HYSTEROLOG** **PROTERON** (Gr. the last first) is an inversion of the natural order or logical sequence of ideas or propositions. This figure is a form of hyperbaton. It is also called **HYSTEROLOGY**. For example, compare Virgil's *moriamur et in arma ruamus* (let us die and rush into arms). Hyperbaton in its several forms is more especially characteristic of poetry than of prose. **PLEONASM** (Gr. *pleon*, more, too much) is the use of superfluous words, sometimes, however, arising from a desire to secure strength, as in the excessive use of the negative in conversation, and especially by uneducated persons, or by children. **POLYSYNDETON** (Gr. *polu*, much, excessively, *syndeo*, to bind together) is pleonasm in the use of conjunctions and is the reverse of *asyndeton*. For the following sentence, "We have ships, and men, and money, and stores," only the last *and* is needed. **PROLEPSIS** (anticipation) consists in introducing a word in advance of its proper place, as "I know *thee* who thou art." Here *thee* anticipates *thou* and is also pleonastic. **PROLEPSIS** also denotes the use of an epithet before it is logically applicable, as *Scuta latentia condunt* (they conceal their hiding (or hidden) shields). Here *latentia* is an example of *prolepsis*, since it anticipates the action of *condunt* and is not strictly applicable until the action of *condunt* has ceased. **SYLLEPSIS** is the agreement of an adjective or verb with only one of two or more subjects with which it is linked, as *rex et regina beati*. **SYNESIS** is a construction of words according to the sense conveyed by them rather than by the strict requirements of grammatical rules, as "Philip went down to Samaria and preached Christ unto them." This meaning is now in English rhetoric included under *Syllepsis*. **TMESIS** (Gr., a cutting) is the separation of the parts of a word, as in Ennius' famous line, "*saxo cere comminuit brum*," or, in "the love of God to us *ward*." **ZEUGMA** is the use of a word in two or more connections, though in strictness, it is applicable to only one of them.

SYNTHESIS (Gr. *Synthēsis*, making a whole out of parts) is a term employed in chemistry to designate the building up of a more or less complicated product from its elementary constituents. As the synthesis of inorganic compounds is usually very simple, we shall confine our remarks to organic compounds. To take a very common substance as an illustration, there is no difficulty in resolving sugar into its elements. An ultimate analysis shows that sugar may be represented by the formula $C_{12}H_{22}O_{11}$, and that any given weight of it contains 144 parts by weight of carbon, 22 of hydrogen, and 176 of oxygen. This pulling to pieces of the sugar is an easy matter, and has been known to chemists for more than half a century; but the putting together of the pieces, or, in other words, the synthesis of sugar, is a much more difficult task. Again, alcohol consists of 24 parts of carbon, 6 of hydrogen, and 16 of oxygen; but no alcohol results from merely making such a mixture. There was a general belief that organic products, such as sugar, alcohol, urea, oxalic acid, taurine, leucine, etc., required for their production a mysterious so-called *vital-force*, totally distinct from the ordinary forces acting on matter. The first blow to this now obsolete doctrine was struck by Wöhler in 1828, when he discovered that *urea* might be artificially obtained. (See ORGANIC COMPOUNDS.) Shortly afterwards Pelouze obtained *formic acid* from inorganic materials, and in 1845 Kolbe effected the synthesis of *acetic acid*, and of its derivatives, *acetone*, *methane*, or *marsh gas*, and *ethane*.

We give a few examples showing the synthesis of some simple organic bodies from the elements. It is, of course, understood that the inorganic reagents used, such as water, H_2O , ammonia, NH_3 , potassium hydrate, KOH , sulphuric acid, H_2SO_4 , may also be prepared from their elements.

First: Carbon burned in oxygen gas produces carbonic acid, CO_2 . This passed over heated potassium forms potassium oxalate, $K_2C_2O_4$ ($2CO_2 + K_2 = K_2C_2O_4$), from which *oxalic acid* may be obtained. Carbonic acid and aqueous vapor passed over heated potassium produce potassium bicarbonate, $KHCO_3$, and potassium formate, $KHCO_2$. From the latter *formic acid*, CH_2O_2 , may be prepared. By subjecting potassium formate to a red heat *formic aldehyde*, CH_2O , and *methyl alcohol*, CH_3OH , are given off. *Formic acid*, *formic aldehyde*, and *methyl alcohol* are the starting-points from which other and higher alcohols, aldehydes, and acids may be built up. Again, carbonic acid reacts with ammonia, producing ammonium carbonate, $NH_4 \cdot CO_2 \cdot NH_3$, which on being heated gives *urea*, $NH_2 \cdot CO \cdot NH_2$; and urea is the source of a long train of organic compounds.

Second: Carbon burned with a limited supply of oxygen produces carbonic oxide, CO . This passed over heated potassium hydrate, KOH , gives potassium formate, $KHCO_2$. Carbonic oxide treated with chlorine in the sunlight gives carbonyl chloride, or phosgene, $COCl_2$, which is a useful synthetical reagent.

If the methyl alcohol, obtained in the preceding paragraph, be treated with metallic sodium, sodium methylate, $CH_3 \cdot O \cdot Na$, is formed. This acted on by carbonic oxide gives sodium acetate, $CH_3 \cdot CO \cdot O \cdot Na$, a source of *acetic acid*, CH_3COOH , or $C_2H_4O_2$.

Third: Carbon heated with potassium hydrate, in presence of nitrogen, gives *potassium cyanide*, KCN , the source of all the cyanides and cyanogen compounds, and from which *hydrocyanic acid*, HCN , is directly prepared. Hydrocyanic acid is also formed by passing a mixture of acetylene, C_2H_2 (see next paragraph), and nitrogen through a red-hot

tube. Hydrocyanic acid may be converted into *formic acid* by the action of aqueous hydrochloric acid, or into *methylamine*, CH_3NH_2 , by reduction with nascent hydrogen. Potassium cyanide on oxidation gives potassium cyanate, KCNO ; from this ammonium cyanate, NH_4CNO , may be prepared. The latter on being heated produces *urea*, $\text{NH}_2\cdot\text{CO}\cdot\text{NH}_2$.

Fourth: The electric arc between carbon points in an atmosphere of hydrogen produces *acetylene*, C_2H_2 . This, mixed with hydrogen and passed through a red-hot tube, gives olefiant gas, or ethylene, C_2H_4 , which, agitated with strong sulphuric acid, produces sulphovinic acid, $\text{C}_2\text{H}_5\text{HSO}_4$. On distilling this acid with water, ordinary ethyl alcohol, $\text{C}_2\text{H}_5\text{OH}$, is formed, and may readily be obtained pure. Ethyl alcohol is the source of chloral, chloroform, acetic acid, etc.

Acetylene alone passed through a red-hot tube gives benzol, C_6H_6 . With this as a starting-point, nitro-benzol, aniline, phenol, naphthalene, anthracene, etc., may be constructed. The ethylene mentioned above can be converted, through several steps, into succinic, malic, or tartaric acid. (See article on CHEMISTRY.)

With the help of the foregoing simple products, an unlimited number of higher and more complex bodies may be built up. The synthesis of such compounds as lactic acid, butyric acid, citric acid, amyl alcohol; the oils of bitter almonds, wintergreen, and cinnamon; glycerine, and most of the fats, presents no great difficulty.

In 1868 Graebe and Liebermann, by starting with anthracene, $\text{C}_{14}\text{H}_{10}$, a hydrocarbon isolated from coal-tar, built up by synthetical processes the substance called alizarin, which occurs naturally in madder root, and which gives the latter its chief value as a dye-stuff. This artificial alizarin is now made on an enormous scale in Germany, and has almost entirely displaced madder in dyeing and calico-printing. In 1880 Adolf Baeyer accomplished the synthesis of indigo. His starting-point was toluol, $\text{C}_6\text{H}_5\text{CH}_3$, a hydrocarbon found in coal-tar. In 1887 Ladenburg succeeded in the synthesis of conine, $\text{C}_8\text{H}_{17}\text{N}$, the poisonous alkaloid found in hemlock. Vanillin, the odoriferous flavoring principle of the vanilla bean, has been made artificially by several chemists. Antipyrin, a new and useful drug, and saccharin, a substance 280 times sweeter than sugar, are entirely the products of synthesis. The beautiful coal-tar colors, erroneously called anilines, such as fuchsin or magenta, methyl, violet, mauve, eosin, safranin, rosolic acid, etc., furnish admirable illustrations of the constructive powers of organic chemistry. These are all examples of the application of synthesis to the useful arts. For further information on this subject, the reader is referred to Roscoe and Schorlemmer's *Treatise on Chemistry* (1881), Vol. III.; to Berthelot's *Leçons sur les Methodes Générales de Synthèse en Chimie Organique*; or to Miller's *Elements of Chemistry*.

We cannot conclude without adverting briefly to the possibility of economically replacing natural processes by artificial ones in the formation of organic compounds. On this subject, one of our most distinguished organic chemists, Dr. Frankland, observes that "at present, the possibility of doing this only attains to probability in the case of rare and exceptional products of animal and vegetable life. By no processes at present known could we produce sugar, glycerine, or alcohol from their elements at one hundred times their present cost, as obtained through the agency of vitality. But although our present prospects of rivaling vital processes in the economic production of staple organic compounds, such as those constituting the food of man, are exceedingly slight, yet it would be rash to pronounce their ultimate realization impossible. It must be remembered that this branch of chemistry is as yet in its merest infancy; that it has hitherto attracted the attention of but few minds; and further, that many analogous substitutes of artificial for natural processes have been achieved."

SYNTONIN, or MUSCLE FIBRINE (Gr. *synteinein*, to render tense), contains in 100 parts: carbon, 54.06; hydrogen, 7.28; nitrogen, 16.05; oxygen, 21.50; and sulphur, 1.11. It is the principal constituent and the essential basis of all the contractile tissues. It may be obtained from muscular fibrin in the form of a coherent, elastic, snow-white mass; but whether it exists in the living body in a solid form or in solution, is undecided. Many recent physiological writers hold the latter view, and maintain that the phenomenon of cadaveric rigidity (*rigor mortis*) is due to its spontaneously coagulating after death.

SYPHAX, b. about 250 B.C.; d. 201; a Numidian prince, who was incited by the Romans to war against Carthage; was twice defeated by Masinissa (q.v.), but at last recovered his throne. Scipio thereupon sought an alliance with Syphax, and to prevent this, Hasdrubal gave his daughter Sophonisba to Syphax in marriage, and not long after Syphax, aided by the Carthaginians, drove Masinissa from his kingdom. Again forming an alliance with Carthage, Syphax, on the landing of Scipio in Africa, B.C. 203, raised a large army which was nearly destroyed by Scipio; two other armies met with the same fate and Syphax was taken prisoner.

SYPHILIS is, according to Dr. Farr's system of nosological classification, to be regarded as belonging to the ethnetic order of zymotic diseases (see NOSOLOGY and ZYMOTIC DISEASES). These diseases have the common property of being developed in the system after the introduction by inoculation or implantation of specific poisons. The poisons which produce diseases of this order may be introduced through any abraded cutaneous surface, or through mucous membranes, especially if any solution of continuity occurs. A morbid poison thus introduced into the system produces a specific effect both on the tissue at the place of insertion and on the blood, as soon as the poison

begins to be become absorbed; or, in other words, it produces both a constitutional and a local change. The absorbed virus seems to undergo the following changes in the living and infected body—viz. (1) Increase, (2) Transformation, and (3) Separation or excretion. Taking our illustrations from the disease to which this article is specially devoted, the *increase* is shown by the fact, that the pus from a single syphilitic sore may by inoculation be made to spread the disease a thousand-fold. The *transformation* is indicated by the successive phenomena which supervene during the course of the disease. For example, syphilis is followed, as we shall presently show, by a series of secondary and tertiary phenomena, which follow a tolerably uniform course in different patients. The *separation or excretion* of the poison may be accomplished in several ways. While in some of the more intense poisons—such as those of certain serpents—the whole mass of the blood seems rapidly affected, in others, as syphilis, “a double process of the zymotic-like action seems to take place before the full effects which the poison is capable of producing are completed. The multiplication of the venereal poison, and its effects upon the system, seem to become developed during the existence of the hardening process which surrounds the infecting venereal sore. This is the first zymotic-like process, and is attended with a local papule, and perhaps an ulcer. From this local sore the system becomes contaminated, and in the blood a second process (of zymosis?) appears to be completed, by which the original poison becomes intensified, its pernicious influence more complete, and its specific, secondary, and tertiary effects are more fully developed.”—Aitken's *Science and Practice of Medicine*, 3d ed., vol. i. p. 666.

From this brief sketch of the nature of enthetic diseases, we turn to the consideration of the special disorder known as *syphilis*—a word whose origin is unknown. The terrible ravages of this disease among our soldiers and sailors, to say nothing of the fearful misery which it occasions in private life, afford more than sufficient apology for our introducing into these pages some of the most important details regarding this repulsive form of disease.* It is almost unnecessary to observe that syphilis is a contagious disease usually propagated by impure sexual intercourse. The following is a brief history of the course of the disease, if its progress is not checked by proper remedial agents. At an uncertain period, varying from three to ten days, after exposure to the infection, one or more venereal ulcers (commonly known as *chancres*) appear upon the generative organs. These ulcers present many varieties, which have been variously classified. The following arrangement, by Mr. Henry Lee, surgeon to the Lock hospital, is an eminently practical one—viz. (1) The Hunterian or indurated or infecting chancre; (2) The non-indurated or suppurative chancre; (3) The ulcerative chancre; and (4) The sloughing chancre. These local affections are so different in their characters, and in their action on the constitution, that each must have a brief separate notice. (1) The *indurated*, or, as it is frequently termed, the *Hunterian chancre*, from its having been first accurately described by John Hunter, is the only one of these local affections that can be associated with constitutional syphilis. Its natural course is thus described by Mr. Lee. “At an uncertain period, but generally from three to four days after exposure to infection, attention may be drawn to the part by a slight itching. On examination, a red spot, surrounded by a little induration, will perhaps present itself, or a vesicle about the size of a millet-seed will not unfrequently form upon the infected part. The cuticle covering this vesicle is so thin that it usually gives way at a very early period; and this commonly happens before the disease has been carefully examined. The base of the vesicle then becomes indurated, and the induration (whether preceded or accompanied by a pimple or a vesicle, or independent of either of these) assumes a circular form, extending equally in every direction, and terminating quite abruptly in apparently healthy parts. A sore generally follows; this is excavated, without granulations, sometimes glazed, at other times having some adhesive matter on its surface. The color of the chancre will depend often upon the amount and character of the substance which adheres to it, and will frequently present a fawn hue, or different shades of brown and red. When this adventitious matter is removed, the sore will usually again assume its original smooth and red glazed appearance.”—“Syphilis” in Holmes's *System of Surgery*, vol. i. p. 400. This variety of sore frequently gives rise to a chronic enlargement of one of the glands of the groin (forming what is termed a *bubo*), which does not involve the skin or the cellular membrane. It is followed by certain

* Dr. Aitken observes that “no statistical nosology gives any idea of the number of men lost to the public service from syphilis. The loss of strength from venereal diseases alone (gonorrhea being included with syphilis in this term, and forming about 40 per cent of the cases) is equal to the loss of more than eight days annually of every soldier in the service.” Dr. Balfour in his *Medical, Sanitary, and Statistical Report of the Army Medical Department* for 1860, relates that “more than one-third of all the admissions into hospital have been on account of venereal diseases (369 per 1000), and the average number constantly in hospital is equal to 23.69 per 1000 of strength (2,315 men), each remaining in hospital on an average 23½ days. Thus the inefficiency is constantly equal to about 2½ regiments.” In 1861, these diseases caused a loss equal to 8.69 days for every soldier serving at home, there being a daily inefficiency of 2,077 men; and the numbers are nearly the same for the succeeding years. The daily loss of service in the navy, in 1862, was about that of 586 men per day. How far these data apply to our civil population, it is hard to say; but it is much to be feared they apply pretty closely. “It is a question,” says Dr. Parkes, “whether a large majority of the young men of the upper and middle class do not suffer in youth from some form of venereal disease. In the lower classes, it is perhaps equally common.”—*Practical Hygiene*, p. 453. For a comparison between the amount of venereal disease in various European armies, the reader may consult the same work, pp. 502, 503.

constitutional symptoms known as *secondary symptoms*, and requires, both in its primary and secondary forms, mercurial treatment. (2) The *suppurating chancre* usually begins as an abrasion, which when fully developed, often presents the same appearance as if a piece of skin had been removed by a circular punch. The sore is covered with ill formed granulations, and extending equally in all directions, maintains its circular form. After continuing three or four weeks, it generally heals, without leaving the hardness which is so characteristic of the Hunterian, infecting or indurated sore. Another important diagnostic difference is furnished by the microscopico-chemical examination of the fluid secreted by the sore. In this suppurating sore the secretion consists of pus, which, on the addition of acetic acid, exhibits the characteristic compound nuclei; while in the infecting sore the secretion resembles turbid serum, presenting none of the characters of the pus. It does not give rise to bubo, nor is it followed by secondary symptoms. (3) The *ulcerative chancre* is a ragged worm-eaten ulceration; secreting an ill-formed pus, and presenting an irritable surface. Soon after the appearance of this sore, one of the glands of the groin will become enlarged and painful. This may be preceded by a shivering fit, more or less marked. The enlarged gland or bubo becomes very tender to pressure, and as the swelling increases, the skin becomes red, especially at the center, and the general symptoms of suppuration present themselves. Great relief is afforded by the discharge of the pus. It is never followed by secondary symptoms, and, like the preceding form, requires only local treatment. (4) The *sloughing chancre* is fortunately rare in this country, but in many foreign ports, in warm and hot countries, this form of syphilis commits great ravages among our sailors, who have given to it certain characteristic names, such as the *black pox*, the *black lion*, etc. It does not affect the inguinal glands, and is not followed by constitutional symptoms, and requires only local treatment.

Before noticing the constitutional or secondary symptoms which follow the Hunterian or infecting sore, we shall very briefly describe the treatment required for the last three forms, in which no constitutional symptoms occur. A suppurating sore should at once be thoroughly cauterized, so as to destroy all the tissues which have imbibed the poison. To secure this result, strong caustics are desirable; and as they sometimes extend further than is desired, an antidote should be at hand, which not only checks the further extension of the caustic, but deadens the pain. The agents most used in these cases are caustics and the mineral acids, and the *potassa cum calce*, a combination of potash and lime, which is prepared in the form of small rods for this purpose. The last of these is on the whole the best, as the extent to which it acts may be accurately regulated. When the action is sufficient, the application of a dilute acid will relieve the pain. Nitrate of silver, which is often employed, is not sufficiently energetic in its action to eradicate the disease. In the ulcerative sore, which is often irritable and painful, opium is useful both locally and internally. In other respects, the same treatment must be adopted as in the preceding variety. As the various means that have been suggested for preventing the suppuration of the bubo, which always accompanies this sore, are of no avail, it is useless to mention them. If, after the bubo has burst, the remains of an indolent, enlarged gland, incapable of forming healthy granulations, are left, caustic must be applied, so as to cause them to slough away. In sloughing sores, the great object is to check the destructive process; for which purpose, fomentations and poultices are applied locally, and large and repeated doses of opium are given internally. The nitric acid lotion, or a solution of potassio-tartrate of iron (10 grains to an ounce of water), is often an efficient local application in these cases.

We now return to the consideration of the Hunterian or indurated chancre, the only variety of venereal sore that gives rise to secondary or constitutional symptoms. If the patient seeks medical assistance as soon as he perceives the sore, it is possible that the application of a caustic will destroy the poison, and prevent any constitutional symptoms. If, however, four days or more elapse before treatment commences, the best local application is some form of mercury, as mercurial ointment spread on lint, or the application of black wash (see LORIONS) steeped in the same material. When the poison has once entered the circulation, and become diffused throughout the body, it is desirable to neutralize it, if possible, before the appearance of any secondary symptoms. A very large number of drugs have at different times possessed an anti-syphilitic reputation, and a few are doubtless useful; as, for example, iodide of potassium. "There is one medicine alone," says Mr. Henry Lee, one of the highest British authorities on the subject, "which, through good report and evil report, in spite of the strongest prejudices of some against its use, and the no less adverse influence of others, who have employed it to an unjustifiable extent, has maintained its general reputation."—*Op. cit.*, p. 418. In these remarks on the value of mercury (if judiciously given) we fully concur; but the mercurialists and non-mercurialists are almost equally divided. It may be given internally in pills or in solution; or it may be introduced into the system through the skin, in the form of ointment; or lastly, it may be employed in the form of vapor, and thus applied to the skin. Of these three methods, none is equal to mercurial fumigation by calomel vapor, either in the readiness with which it removes the symptoms, or the slight disturbance it excites in the constitution, or in its certainty in preventing relapse. This process is a very simple one. A piece of brick must be heated to a dull red heat, and placed in a pan having a little water at the bottom. A quantity of calo-

mel, varying from 10 to 20 grains, is placed on the top of the brick; and the patient then sits over the pan in a cane-bottomed chair, enveloped from his neck downward in a large blanket.* The operation is best performed at bedtime; it is complete in a quarter of an hour; and when the patient is sufficiently cool to put on his night-shirt, he should go to bed without disturbing the calomel on the surface of the skin. It is almost impossible to produce salivation by this means of administering mercury; and all that is requisite is to produce a slight tenderness of the gums. The system must be kept under this gentle influence of the mercury till the induration in the primary sore has disappeared. At a period usually varying from one to two months after the first appearance of the induration (which is regarded by some writers as the first of the secondary symptoms), slight febrile symptoms, usually followed by an exanthematous eruption of the skin, often accompanied by sore throat, will occur. This eruption is a variety of *roseola*; it is of a rose-red color, which disappears on pressure, and is not raised above the surface. It generally disappears in a few days, but if it persist, it will gradually change to a copper color, which is characteristic of all syphilitic eruptions which remain for a considerable time without suppurating or ulcerating. The syphilitic eruptions which usually follow this primary rash may assume the varied forms of lichen, syphilitic tubercle, lepra, and psoriasis; and the best mode of treating them is by applying local mercurial fumigation, and at the same time giving iodide of potassium (in five-grain doses thrice a day) internally. Occasionally, in persons with impaired constitutions, syphilitic eruptions assume a pustular character. For a description of these eruptions, we must refer to Cazenave's *Manual of Diseases of the Skin*, translated by Burgess. Similarly, there are cases in which, from some constitutional peculiarity, or, as Mr. Lee suggests, from some want of power in carrying out the natural processes of the disease, the syphilitic eruption may be accompanied by an effusion of serum only; or, in other words, may be of the vesicular type. Thus, we hear of syphilitic herpes, syphilitic eczema, etc. These forms must be treated as the others.

Among the secondary syphilitic diseases of the mucous membrane, may be especially noticed (1) mucous tubercles, (2) deep ulcer of the tonsils, and (3) syphilitic laryngitis. *Mucous tubercles* appear as small tense eminences inside the cheeks, on the arches of the palate, on the lips, on the generative organs, and on the rectum. A solution of corrosive sublimate applied locally (one or two grains to the ounce of water), or calomel, proves an effective local application. *Deep ulcer of the tonsils* is best treated by corrosive sublimate given internally, in doses of $\frac{1}{12}$ of a grain three times a day, in compound tincture of bark and water; and also used as gargle (in the proportion of 2 grains to a mixture of 7 ounces of water and 1 of honey). *Syphilitic ulceration of the larynx*, commonly known as *syphilitic laryngitis*, is characterized by pain or tenderness in the region of the thyroid cartilage (see LARYNX), huskiness of the voice, a hacking cough from attempts to expectorate, with occasional expulsion of purulent matter mixed with blood. If the disease is not checked, enervation, night-sweats, and dangerous exhaustion, ensue, and life is often terminated by suffocation.

In noticing the secondary symptoms, *syphilitic iritis* must not be overlooked; its symptoms and treatment are described in the article IRRIS.

Our limited space precludes more than a very brief allusion to the more important tertiary syphilitic affections. The most important of these are those which attack the bones and their coverings. They may be included under the heads of acute and chronic periostitis (the latter being very common), nodes and exostosis, inflammation of bone, caries, and necrosis; next to these are tertiary affections of the skin and mucous membrane, which consist mainly of intractable ulcerations attacking the face (especially the nose and lips), nails, ears, and mucous membranes of the various openings of the body; and diseases of the glands. In many of these cases a modified form of mercurial fumigation is most useful; but if mercury, even in this form, is thought inexpedient, in consequence of the general debility of the system, iodide of potassium, combined with any of the preparations of sarsaparilla, may be employed. Bark, iron, and the mineral acids are also of service in restoring the strength; and opium, by relieving the nocturnal pains which are so frequently present, will also prove most useful. The reader who wishes to pursue this subject further may be referred to Aitken's *Science and Practice of Medicine*, in which he will find an account of the tertiary syphilitic affections of the nails, heart, brain, lungs, liver, and tongue.

THE SYPHILIS OF CHILDREN is a subject which must not be omitted in an article on this disease. If the constitution of either the father or mother of an infant is saturated with the syphilitic poison, the child may be born with certain symptoms indicating that it is suffering from *congenital syphilis*. Moreover, the child of a mother having a primary sore, but no constitutional symptoms, may be inoculated with syphilis during the act of delivery; or the disease may be communicated in vaccination (if the matter be derived from an impure source); or by contact with syphilitic sores on the persons of wet-nurses or others. All these cases are included in the *infantile* variety of the disease. One of the most striking symptoms of true congenital syphilis is that which is popularly known

* A simple apparatus for mercurial fumigation, consisting of a kind of tin case containing a spirit-lamp, may be procured from dealers in medical and surgical apparatus, by those who object to rough bricks and coarse pans. A special fumigating cloak, in place of the blanket, is sold with the apparatus.

as the *snuffles*, in which a discharge collects in the nose, and sometimes blocks it up so completely that the infant is unable to suck for any length of time. The skin presents an eruption of spots, which are usually somewhat coppery, but sometimes of a rose-red tint; while on the soles of the feet and the palms of the hands the cuticle scales off, and an appearance like that of psoriasis is presented; and flat mucous tubercles occur at the parts where the skin and mucous membrane merge into one another. White ulcers of a crescentic form often occur in the mouth; and with these symptoms there is nearly always observed "the wizened and shrunken look, the anxious expression, and the dirty hue of the skin (a kind of dirty greenish yellow), which imparts to the infant a peculiarly repulsive aspect of old age."—Holmes, "On the Surgical Diseases of Childhood;" *op. cit.*, vol. iv. p. 830. Congenital syphilis frequently causes the death of the fetus at about the fourth or fifth month; and if a woman is repeatedly delivered of dead children from the fourth to the seventh month, the practitioner may fairly conclude that a syphilitic taint is *probably* present. In other cases the child is born alive with the "snuffing" and eruption; but, in the majority of cases, the infant when born is apparently healthy, and the disease does not show itself till about six weeks after birth.

When congenital syphilis is diagnosed with certainty the medical attendant has a very important duty to perform, from which he must not shrink from any feelings of delicacy. He must discover which of the parents is affected, and must prohibit further cohabitation until the secondary symptoms have been completely removed by the treatment which has already been described. "Neglect of this precaution," says Mr. Holmes, in his excellent memoir on congenital syphilis (contained in the 4th vol. of his *System of Surgery*), "may not only entail on the couple the misery of a family of deformed, puny, and ailing children, but to the woman at least is fraught with grave personal danger. Whatever may be the case among the poor, there is no doubt that, in the better classes, congenital syphilis is usually derived from the father, the mother being unaffected except through the fetus." There is scarcely a doubt that a woman carrying a syphilitic fetus may become thus infected with secondary syphilis by the exchange of fetal and maternal blood in the placenta; and this explains how it is that women who have never had the primary infecting sore occasionally show all the symptoms of secondary syphilis after living for some years with husbands similarly affected.

Allusion has already been made to the fact that *infantile* (not *congenital*) syphilis may be communicated by vaccination. There is undoubted evidence that in the year 1861, in a thinly populated district of Piedmont, in which syphilis is virtually unknown, 46 children of various ages were simultaneously attacked with syphilis proceeding from chancres in the arm, and followed by buboes (enlarged glands) in the armpits; and that all these children had been vaccinated directly or indirectly from a single child, who was subsequently proved to have contracted syphilis from a wet-nurse; and further, that these children transmitted the same disease to a number of women, their wet-nurses, mothers, etc., and even to children who nursed and played with them; that the women so infected communicated the disease to their husbands; and finally, that the disease yielded in all cases to the ordinary treatment adopted in syphilis. This, as Mr. Holmes observes, is by far the most convincing instance of the propagation of syphilis by vaccination; but several others are recorded by Mr. Lee (*Lectures on Syphilitic Inoculation*, 1863) and other writers.

Cases in which the nipple of the wet-nurse has been infected by a syphilitic infant are by no means rare, and have in various instances given rise to litigation.

Congenital syphilis and infantile syphilis generally must be treated with mercury—either in the form of inunction, by keeping a flannel band, smeared twice a day with mercurial ointment, in constant contact with the thigh or arm for about six weeks; or internally, by the careful use of gray powder (*hydrarg. c. cretâ*), in doses of a grain and half or two grains, twice a day; combined with a little compound chalk-powder, if any irritation of the bowels occurs. The snuffles will be relieved by syringing the nostrils with lukewarm water, and then introducing a couple of drops of almond or olive oil.

In a foot-note to an early paragraph of this article, we gave abundant evidence of the appalling prevalence of this disease. In his valuable treatise on *Practical Hygiene*, Dr. Parkes discusses the question of the prevention of this disease among soldiers; as, however, his remarks for the most part are applicable to other classes, we shall briefly notice them. The means of prevention which he discusses are: 1. *Continence*, which is promoted by (a) the cultivation of a religious feeling and of pure thought and conversation; (b) the removal from temptation and occasions to sin; (c) constant and agreeable employment, bodily and mentally; and (d) temperance. 2. *Early marriage*.—At present only 6 per cent. of the soldiers are allowed to marry. 3. *Precautions after the risk of contagion*.—In some French towns the use of lotions and washing is vigorously enforced, with the effect of lessening disease considerably. 4. *Cure of the disease in those affected by it*.—Health-inspections, in special reference to venereal diseases, are made weekly in the army by the surgeon or assistant-surgeon. But although similar inspections of all recognized prostitutes have long been made by legal authority in many parts of the continent, no attempt at legal interference with the disease in women was made in Great Britain till 1864, when the "contagious diseases bill" was passed, by which, in the neighborhood of certain places (Portsmouth, Plymouth, Woolwich, Chatham, Sheerness, and Aldershot), prostitutes who were found diseased might be taken to an hospital, and

there detained till cured. A committee appointed a few years ago by government to report upon the best means of checking the disease in the English army, in Feb., 1866, issued their recommendations; the most important of which are—(1) the periodic inspection of all known prostitutes in the garrison towns placed under the provisions of the act of 1864; (2) the appointment of a surgeon vested with the necessary powers; (3) punishment for infringement of the act; (4) the extension of its operation to all garrison and seaport towns used by troops or ships; (5) the prohibition of the residence of public women in beer-shops; (6) that the Lock hospitals be placed under government control, and lastly, that the police supervision of the women in the streets of such towns be more stringent. The evidence taken by this committee seemed to prove that the working of the act of 1864 was decidedly useful. (A contrary report was issued, 1882.) For an account of the various plans which are adopted on the continent for the prevention of this disease—such as the registration of brothels and of prostitutes, and the enforcement of periodic examinations at short intervals—the reader is referred to the various works of Parent-Duchatelet, Acton, Sanger, and others on prostitution; to Lancereaux's *Traité sur S.*; to Lee's *Lectures*; and to two articles by Dr. Holland (of Cork) in the *British and Foreign Medico-Chirurgical Review* for 1852. See PROSTITUTION.

Without entering into any prolonged details regarding the history of this disease, we may briefly mention that, toward the close of the 15th c., a great epidemic of syphilis pervaded Europe, and that it was supposed to have been imported from the new world; and that, in the 16th c., syphilis was recognized as the result of a specific virus. During last century the history of this disease is divisible into three distinct periods, in each of which very different views have been prevalent. These may be described as—1. *The period and doctrine of Hunter*, who believed that the various forms of syphilis and gonorrhea depend upon one and the same poison—a view taught by Carmichael in Dublin, Cazenave in Paris, and others. 2. *The period and doctrine of Ricord*, who proved that gonorrhea was quite different from syphilis, and that inoculation with gonorrheal matter will not cause a chancre; and that there are two classes of chancres, the *soft* and *hard*, originating from the same source. 3. *The present period*, commencing in 1856, in which it is held that, exclusive of gonorrhea, there are two forms of the syphilitic poison. It has been judiciously advised by Mr. Longmore, the professor of military surgery in the army medical school, that in accordance with our present knowledge of this disease, the term *syphilis* or *syphilitic* should be restricted to such cases as are believed to be of a specific infecting kind, while the term *local venereal sore* or *venereal ulceration* should be applied to those cases which require merely local treatment, and are not followed by constitutional symptoms.

SYPHILIZATION is the term used to designate an operation which has the double object of eradicating syphilis already existing in the system, and of securing permanent immunity from any future attacks, by means of repeated inoculations of syphilitic poison. As long ago as the year 1844, a French physician, Auzias Turenne, undertook a number of experiments, with the view of testing whether John Hunter's view, that syphilis could not be communicated to the lower animals, was correct. After some failures he succeeded in producing venereal sores (chancres) in monkeys by inoculating them with the human virus; and he found that rabbits, cats, and horses might be similarly infected from the chancres of the monkey. He likewise found that the chancres produced by inoculation became less and less in each animal, until a period at length arrived at which the poison seemed to have lost all its power, and no further sores could be produced; and he was thus led to believe that by prolonged inoculation the system became protected. The subject was next taken up by Sperino of Turin, who inoculated patients suffering from syphilis by virus from a chancre, and repeated the inoculation once or twice a week, till the poison—as in the case of Turenne's animals—ceased to produce any effect; and when this point was reached, all the other sores had healed. In 1851 Prof. Boeck of Christiania, when traveling through Italy, had his attention drawn to the doctrine of syphilization; and from that time to the present, he has devoted himself unremittingly to it, and is now the great authority on the subject. In 1858 Boeck, in consequence of the results he had attained from the practice of syphilization in cases where no mercurial treatment had been prescribed, alleged that syphilization might in such cases be regarded as a complete and certain cure. In cases where mercurialization has been practiced, the use of iodine has to be persisted in during syphilization. During the summer of 1865 Dr. Boeck visited London, and took active steps to make his views on this subject accurately known in this country, and the surgeons of the Lock Hospital submitted a series of cases to his mode of treatment; and Mr. James Lane, one of the surgeons to that institution, asserted in 1866 that "hitherto, as far as he had seen, it had effected everything which had been promised for it. The progress of the cases in the Lock Hospital had in almost every detail corresponded to the predictions of Prof. Boeck respecting them. In several of those who had been longest under treatment, immunity from inoculation with primary syphilitic matter had been arrived at." The progress of syphilization as a remedy for syphilis and as a proof against syphilitic infection, has not been well marked in this country. Most surgeons are agreed as to the correctness of Prof. Boeck's views, but the practice itself is offensive, and the length of time necessary for its being effectively carried out forms

an objection to its practice. In Sperino's experiments, the treatment extended from 9 to 20 months or more. The practice has been much in vogue in Christiania under Boeck and his colleague M. Bidekap; but it is unlikely to command attention other than of scientific kind, and as tending to acquaint us with the history of syphilis and with the nature of syphilitic infection.

SYRA (anc. *Syros*), the most important, though not the largest member of that group of islands in the Ægean sea known as the Cyclades (see GREECE), lies 13 m. s. of Andros. It is about 10 m. long by 5 broad, bare, hilly, and not very fertile. The products are wine, tobacco, grain, citrons, figs, honey, and vegetables; but the greater portion even of the common necessities of life have to be imported from Greece and foreign countries. Its prosperity is of quite modern growth. During the war of independence, Syra remained neutral, and, in consequence, numerous fugitives flocked thither from other parts of Greece, especially from Chios and Psara, who, besides adding largely to the population, brought with them a spirit of political activity and commercial enterprise, the beneficial effects of which are now strikingly visible. Area, 44 sq. m. The capital *Syra*, or *Hermopolis*, is situated on a bay on the e. side of the island. It rises terrace-wise from the shore, is well built, and is the seat of government for the Cyclades, and the residence of foreign consuls. It has numerous educational institutions. Syra has become the great commercial entrepôt of the Ægean. Nearly one-half of all the imports of Greece reach it through this port. It builds more ships than any other town in the Levant, and owns one-third of all the Greek merchantmen. It has likewise regular steam communication with all the principal trading towns in the Levant. Pop. of the town of Syra, '90, 22,104.

Ancient notices of Syra are scanty. Homer praises it in the *Odyssey* as "rich in pastures, in herds, in wine, in wheat;" but it has no history.

SYRACUSE, anciently the most famous and powerful city of Sicily, situated on the south-eastern coast of the island, 33 m. s.s.e. of Catania, was founded by a body of Corinthian settlers under Archias, one of the Bacchiadæ, 734 B.C. The original colonists seem at first to have occupied nothing more than the little isle of Ortygia, about 1 m. long, and half a mile broad, which lies near the shore. It rapidly rose to prosperity, and was enabled to establish sub-colonies of its own: Acraë (664 B.C.), Casmenæ (644 B.C.), and Camarina (599 B.C.). Nothing definite is known of the early political state of Syra; but before 486 the political power had passed into the hands of a few leading families, or perhaps *clans*, who constituted an oligarchy, while the great body of the citizens formed a malcontent democracy. In that year a revolution took place. The oligarchic families—*Geomori* or *Gamori*, "landowners;" probably the descendants of the original colonists, like the patrician *gentes* of Rome—were expelled, and the sovereign power was transferred to the citizens at large. Before a year passed, however, Gelon (q.v.), "despot" of Gela, had restored the exiles, and at the same time made himself master of Syracuse. He was a great ruler, and under him the city increased in size and wealth. It is believed to have been in Gelon's time that the adjoining mainland was first built upon. The locality of the new settlers was the slopes and heights of Achradina, or the "outer city," a triangular table-land n. of the island of Ortygia, and subsequently connected with it by a mole. It ultimately became the most extensive and populous quarter of Syracuse—contained the agora, a temple of Zeus Olympios, the Prytaneum, with a splendid statue of Sappho, the fine monuments to Timoleon and the elder Dionysius (q.v.), etc. It may be convenient to mention here the other two quarters of the city, especially as the date of their settlement is not known. These were Tyche—so called, according to Cicero, from an ancient temple of "fortune" erected there—occupying a plateau to the w. of Achradina; and Neapolis (new city), stretching along the southern slopes of the plateau, and overlooking the marshes of the Anapus and the "great harbor," a spacious and well sheltered bay, about 5 m. in circumference. Neapolis became one of the finest parts of Syracuse. Here were situated the theater, amphitheater, and numerous temples, of which hardly a relic remains, except of the first mentioned. Ortygia contained the castle or citadel which immediately fronted the mainland, and overlooked the docks or *navalia* in the "lesser harbor."

Reverting to the history of Syracuse, which we must touch upon only in the most cursory manner, a noticeable characteristic of the reign of Hiero (q.v.), the successor of Gelon, is his cultivation of the fine arts, and his liberal patronage of men of genius, as Æschylus, Pindar, etc. In 466 B.C., the democracy again got the upper hand—Thrasylbulus, a "tyrant" of the baser sort, being expelled; and for sixty years a free and popular government was enjoyed, under which Syracuse flourished more than it had ever done. During this period occurred its great struggle with Athens (415–14 B.C.), in which it came off victorious, and its renown at once spread over the whole Greek world. But a new power appeared on the stage—the Carthaginian, whose conquests in Sicily, toward the close of the 5th c., threatened the supremacy of Syracuse. Meanwhile, Dionysius (q.v.) restored the "tyranny" of Gelon, and during a reign of 38 years greatly increased the strength and importance of the city. It was he who constructed the docks in the greater and lesser harbors, and surrounded the city with fortifications. His fierce and victorious war with Carthage (397 B.C.) raised the renown of Syracuse still higher. The reigns of the younger Dionysius (q.v.) and of Dion were unsettled; but

after the restoration of public liberty by Timoleon (344 B.C.), a brief season of tranquillity ensued, during which the prosperity of the city rapidly revived. Under Agathocles, however, the despotic form of government was again established (317 B.C.), and continued, with scarcely an interruption, down to the conquest of the city by the Romans (212 B.C.) during the Hannibalic war—the ruler of Syracuse, Hieronymus, a rash and vain young man, having abandoned the prudent policy of his grandfather, Hiero (q.v.), broken the alliance with Rome, and joined the Carthaginians.

Under the Romans, Syracuse slowly but surely declined, though it always continued to be the capital and first city of Sicily. Captured, pillaged, and burned by the Saracens (878 A.D.), it sunk into complete decay, and is at present confined to its original limits, Ortigia, which, however, is no longer an island, but a peninsula. Pop. '95, commune, 25,300. The streets of the modern town are, with few exceptions, narrow and dirty. Syracuse has a cathedral, a museum of classical antiquities discovered in Syracuse and the neighborhood, a public library, with some curious MSS., numerous churches, monasteries, and nunneries, and carries on a trade chiefly in wine, oil, salt, and salt fish.

SYRACUSE, a province in e. Sicily, on the coast; drained by the Abisso, Anapo, and Ragusa rivers; 1442 sq. m.; pop. '91, 395,797. The surface is mountainous except in the south. Along the sea-coast and in the river valleys the soil is fertile, and adapted to pasturage. Agates and marbles are found. Capital, Syracuse.

SYRACUSE, city and co. seat of Onondaga co., N. Y.; on Onondaga lake, the Erie and Oswego canals, and the Delaware, Lackawanna, and Western, the New York Central and Hudson River, the Rome, Watertown, and Ogdensburg, the West Shore, and several local railroads; about midway between Albany and Buffalo. The site belonged to the Onondaga Indians, and was visited by Jesuit missionaries as early as 1654. By treaties in 1778 and 1795, the state bought from the Indians the tract containing the salt springs, and constituted it the Onondaga Salt Springs reservation. Subsequently portions of the tract were sold to individuals. The present city is a consolidation of the former villages of Salina, Syracuse, Geddes, and Danforth, effected in 1887; with an enlargement of limits authorized by the legislature in 1892. It is known as the "Central city" from its geographical location in the state, and as "Salina city" from its salt interests; and is more widely known as the seat of Syracuse university (q.v.). Among the noteworthy buildings and institutions are the U. S. government building; state hospital for feeble-minded children; co. court-house; city hall; Syracuse athletic club; St. Joseph's, city, women's, and Catholic maternity hospitals; house of the Good Shepherd; house of Providence for Catholic boys; St. Vincent's orphan asylum; Jewish orphan asylum; German asylum; Franciscan convent; Sacred Heart academy for boys and girls; St. John's academy for Catholic boys; high school; Keble school for girls; and the Central, court of appeals, Y. M. C. A., co. orphan asylum, university, and school libraries. The city is the seat of a Protestant Episcopal and a Roman Catholic bishopric. There are Burnet and Genesee parks, the Onondaga Indian reservation, electric lights, electric street railroads, waterworks owned by the city and supplied from Skaneateles lake, about 130 churches, national, state, and savings banks, and numerous daily, weekly, and monthly periodicals. The U. S. census of 1890 reported for Syracuse, 1246 manufacturing establishments, employing \$22,853,424 capital and 17,518 persons, paying \$8,520,677 for wages and \$14,104,504 for materials, and having a combined output valued at \$29,297,241. The principal manufactures are soda ash, carbonate soda, salt, bicycles, clothing, plows, iron and steel, hardware, malt, beer, ale, chemicals, wax candles, typewriters, furniture, wheelbarrows, and castings. Pop. '90, 88,143.

SYRACUSE UNIVERSITY, at Syracuse, N. Y., comprises four colleges, liberal arts, fine arts, medicine, and law. There are a library of 50,000 volumes, an observatory with Alvan Clark telescope, museums with ample illustrative specimens and a gymnasium and athletic field. Courses with electives are offered in classics, philosophy, science, pedagogy, civil and electrical engineering, architecture, belles-lettres, music and painting. The faculty in 1897 numbered 110, and there were over 1100 students. Chancellor, James R. Day, S.T.D., LL.D.

SYRIA (Arab. *E'sham*, Turk. *Soristan*), a division of Asiatic Turkey bounded on the n. by portions of Asia Minor, on the w. by the Levant, and on the s. by Arabia Petræa; on the e. and s.e. its boundary is rendered indefinite, in great part, by the sands of the desert, but at length becomes fixed by the course of the Euphrates. It is divided into several governments, which frequently change their limits. They are usually named after the principal towns—Aleppo, Damascus, and Beyrout. The population in 1885 was 2,676,943, the area 115,144 sq. m. The whole region is traversed by a double mountain-chain—of which Lebanon (q.v.) forms the highest part—touching in its northern extremities the Alma Dagh (anc. *Mons Amanus*) and in its southern forming the Sinaitic range. The central part of this mountain system, which in many places exhibits the characteristics of a plateau, presents on the w. a steep front toward the Mediterranean, but on the e. rolls gradually away into the level uplands of the Syrian wilderness. The most noticeable features of the long furrow between the double ridge, beginning at its southern end, the gulf of Akaba, are the waterless wady of Arabah, the narrow, deep-sunken region known as *El Ghur*, through which the river Jordan flows, and which embraces the Dead sea and the sea of Galilee, and the vale of Cœle-Syria, and its great continuation northward, watered by the Nahr-el-Asy (anc. *Orontes*). The western ridge is broken through in three places: in the n. by the lower Orontes; in the middle near Tripolis,

where the chain of Lebanon properly terminates; and further s., near Tyre, by the Leontes. South of Tyre it recommences in the hill country of western Palestine (q. v.), which finally passes into the desert plateau of El Tyh, in the Sinaitic peninsula. The eastern ridge is less sharply defined, its most conspicuous elevations being Anti-Libanos, the mountains of Moab (east of the Dead Sea), and Mount Seir, overlooking the Wady Arabah. The principal rivers are the Orontes (q. v.), the Leontes, the Jordan (q. v.), the Barada or Abana, the river of Damascus. The only lakes worth mentioning are the Dead Sea (q. v.) and the Sea of Galilee.

Although Syria belongs to the countries comprised within the Asiatic rain-zone, yet in general the climate is excessively dry and hot, differing little from that of Arabia. Drought and scantiness of vegetation characterize almost equally the uplands and the valleys. Only where the mountains are lofty, the streams abundant, and the atmosphere somewhat maritime, as in the terraced slopes of Lebanon, do we find some approach to tropical luxuriance in flower, and fruit, and tree. Forests of evergreen, beautiful grassy pastures, and meadow-tracts are found there; and wheat, maize, rice, etc., are largely produced. The cultivation of the vine, the cotton tree, the mulberry, and also the finer sorts of fruits, as the olive and fig, is considerable, while indigo and sugarcane are raised in the valleys of the Jordan and the region round about the Dead sea. The fauna of Syria, like its climate and vegetation, is similar to that of Arabia. The camel is of almost as much importance as further s., and the Syrian deserts, particularly toward the n., are the home of gazelles, hyenas, jackals, bears, and buffaloes.

The greater part of the Syrian mountains is limestone; mountain limestone in Lebanon, chalk in Anti-Lebanon, and Jura limestone in Palestine. In the last of these volcanic formations occur, especially in the region of the Jordan and the Dead sea, where hot springs, beds of bitumen and sulphur, the shapes of the hills, and the frequent earthquakes afford unmistakable evidence of volcanic activity. Salt is the only mineral of much consequence, and is exported in considerable quantities; coal, however, is worked near Beyrout. Sheep, goats with hanging ears and silky hair, cattle, mules, and asses form, as in ancient times, a great part of the wealth of the inhabitants.

Silk is the chief article of manufacture—at Aleppo, Beyrout, Damascus, etc.—but cotton and woolen fabrics, gold and silver thread-stuffs, glass, earthenware, leather, soap, etc., are also manufactured in different parts of the country. The want of roads is a great hindrance to industrial activity. The first carriage-road was opened in 1863, between Beyrout and Damascus.

The religious sects of Syria are numerous. The Maronites (q. v.) number 482,000; Mutualis, 30,000; Yezidjis, 25,000; Nusairih (q. v.) or Ansyrieh, 80,000; Chaldeans or Nestorians (q. v.), 40,000; Syrians (q. v.) or Jacobites, 10,000; and Druses (q. v.), 90,000. The inhabitants are in some sense a mixed people, for the country has experienced many political vicissitudes, but by far the greatest number, whether Christians or Mohammedans, are of Shemitic origin, either Phenician, Aramaean, or Arabic. Their Turkish rulers, however, and such Turkomans and Kurds as we find settled in the n. of Syria, belong to the Turanian race. Arabic is everywhere spoken, and may be considered the national language, since the old Syriac or Aramaic tongue is wholly dead, except among the Nestorians of Kurdistan.

The history of Syria stretches far back into remote antiquity. In the time of Abraham (2,000 B.C.) Damascus was a city; in the oldest literature of Greece Sidon figures as the capital of a rich, populous, and civilized state; and in the Hebrew Scriptures, Canaan or Palestine is crowded with towns at the period of its conquest by Joshua; but, like most other so-called nations in early times, Syria did not form a single state; it was rather a congeries of independent states whose inhabitants belonged to the same race. Every important city had its king, whose normal occupation was fighting with his neighbors. Under David and Solomon something like political unity was achieved; yet it does not appear that these great rulers dispossessed of their territories the princes whom they subdued, but only made them tributary, and after their death things reverted to their previous condition. Rezin, a slave, then made himself master of Damascus, and extended the Damascene monarchy over all northern and central Syria; but the conquests of Tiglath-Pileser resulted in its becoming a province of the Assyrian empire. Subsequently the whole land, including Palestine, became part of the successive empires of Babylonia, Media, Persia, and Macedonia. Then followed the dynasty of the Seleucidæ (q. v.). After their fall Syria passed into the hands of the Romans, who retained it, though not continuously—for on several occasions the Persian Sassanidæ (q. v.) managed to wrest it from them—until the Arab conquest (7th c. A.D.). During the crusades (q. v.) of the middle ages several Christian principalities were established here, but endured only for a short period. Syria now became a possession of the sultans of Egypt, in whose time it was frightfully devastated by the Mongols. In the 16th c. it was conquered by the Turks, and has ever since formed part of the Turkish empire.

SYRIAC. I. The language is a dialect of the Aramean, anciently spoken through out Syria, the form preserved in literature being probably that of Edessa. After the Mohammedan conquest, 636 A.D., it was gradually displaced by the Arabic; and since the 13th c. it has been used only as an ecclesiastical language in the Syrian churches, and spoken corruptly in a few districts of mount Lebanon and on lake Oroomiah. This last has by the labors of the American missionaries been made a written language. The Syrian alphabet contains 22 letters, all consonants, read from right to left, and 5 vowels denoted by diacritical points. In grammar it shares the Aramaic peculiarities; its

vocabulary contains Persian, Greek, Latin, Arabic, Tartar, and even French and English words—traces of the nations that have ruled Syria. II. The literature corresponding to the condition of the country—which was continually subject to foreign dominion—has no freshness, is made up of translations, and largely on religious subjects. It may be divided into three periods: I. *Before the Mohammedan conquest*, 636. Syriac was then a spoken language, and the universities of Edessa and Nisibis were famous through the east. It produced the Peshito (i.e. the simple) version of the Bible, the oldest Syriac book extant, and accepted among all parties in the Syrian church. The Old Testament version was made by Christian translators directly from the Hebrew, and the New was made at Edessa in the 2d c., or the beginning of the 3d. II. 613–1318 was the period of decay; at the beginning Syriac and Arabic were both spoken, and at the end both were used in books. III. *From 1318 to the present time*. Arabic is the spoken language; and Syriac is cultivated only as an ecclesiastical language, and chiefly in the Maronite college at Rome. See **SHÉMITIC LANGUAGES**.

SYRIAC VERSIONS. Apart from the Peshito (q.v.), there were other Syriac versions of the Old Testament current among the Syrian Christians, although they did not acquire canonicity among them. These were chiefly translated from the LXX., and the best known among them is one drawn up from the text of the Hexapla (q.v.; compare also **ORIGENES**), which it follows most slavishly, without any regard for Syriac idiom or grammar. It contains the critical marks of Origen, and is moreover furnished with numerous variants, fragments from other Greek versions, and exegetical scholia. Bishop Paulus of Tela is supposed to have composed it at the instigation of bishop Athanasius, 617 A.D. There are now only a few (imperfect) MSS. extant of it—one in Paris, one in the Ambrosian library (a third, once in the possession of T. Masius, has disappeared), and further portions are found in the Nitrian collection in the British museum. The greater part of the Biblical books has been edited from it, but in separate publications. A complete edition is still a desideratum. An attempt is now being made toward a more complete edition of the Hexapla itself by a reconstruction of lost portions of the Greek, through the medium of the parallel Syriac passages preserved in this translation. Two other MSS. in the Paris library contain fragments of another Greco-Syriac version, by Jacob, bishop of Edessa, who, in 703 and 704 A.D., composed it from the Peshito and the above translation, which is probably to be understood in the sense of his having made a new recension of Paulus of Tela's work, corrected after the Peshito.

SYRIAN RITE, CHURCH OF, that portion of the oriental church which had its seat in Syria, and which was anciently comprehended in the patriarchate of Antioch, and (after that of Jerusalem obtained a distinct jurisdiction) in the patriarchate of Jerusalem. The Syrian church of the early centuries was exceedingly flourishing. Before the end of the 4th c., it numbered 119 distinct sees, with a Christian population of several millions. The first blow to the prosperity of the Syrian church was the fatal division which arose from the controversies on the incarnation. See **MONOPHYSITES, NESTORIANS, EUTYCHES, JACOBITES**. The Eutychnian heresy, in one or other of its forms, obtained wide extension in Syria; and the usual results of division ensued in the corruption and decay of true religion. The Moslem conquest accelerated the ruin thus begun; and from the 7th c. downward, this once flourishing church declined into a weak and spiritless community, whose chief seat was in the mountains, and whose best security from oppression lay in the belief on the part of the conquerors of their utterly fallen and contemptible condition. Under the head **MARONITES** has been detailed the most remarkable incident in the later history of the Syrian church. This branch of the eastern Christianity, although for the most part divided from the orthodox Greek church by the profession of Monophysitism, took part with the Greeks in their separation from the w., under Michael Cerularius; and the reunion of the Maronites to Rome had the remarkable result of establishing side by side, within the narrow limits occupied by the Christians under the Moslem rule in Syria, two distinct communities, speaking the same language, using the same liturgy, and following the same rites; and yet subject to two different patriarchs, and mutually regarding each other as heretics and apostates from the ancient creed of their country.

The chief peculiarity of the Syrian rite, as contradistinguished from the Greek, consists in its liturgy, and the language of that liturgy, which is Syriac, and with which the people, and in many cases the priests, are entirely unacquainted. The liturgy is known as the liturgy of St. James. The Syrians agree with the Greeks in the use of leavened bread, in administering communion under both heads, in permitting the marriage of priests (provided they marry before ordination), and in administering the unction of confirmation at the same time with baptism even to infants.

The Christian community of Syria may at present be divided into four classes: the Maronites, the Greeks (who are also called Melchites), the Monophysites, who are called Jacobites, and the primitive Syrian Christians (not Maronites), who are in communion with Rome. This last-named community forms the small remnant of the ancient Syrian church, which remained orthodox during the controversy on the incarnation, at the time of the general lapse into Monophysitism. To these are to be added the Christians of the Latin rite and a few Protestants. The Maronites number about 160,000; the Greeks are said to be about 180,000; the Jacobites of Syria and of Armenia proper are said to

reckon together about 40,000 families, of whom, however, probably scarcely 10,000 can be set down to the account of the Syrian church. The non-Maronite Syrians who follow their national rite, but are in communion with Rome, are supposed to amount to about 5,000. The resident Latins are chiefly members of the religious orders who from immemorial time possess convents in the Holy Land, and European Catholics, who have settled permanently, or for a time, at Jerusalem, Beyrout, and Damascus. None of these can in any way be regarded as belonging to the Syrian church. It may be well to add, that the belief, and in most particulars the disciplinary practice of these several classes coincide substantially with those respectively of the same communities in the other churches of the east. All (with the exception of the Maronites and the few united Syrians of the Greek communion reject the supremacy of the Roman see. The Syrians of the Greek communion reject the double procession of the Holy Ghost; and the Jacobites firmly maintain their old tenet of Eutychianism. Among them all are to be found monks and religious females. All enforced celibacy on their bishops, and refuse to priests the privilege of contracting a second marriage, or of marrying after ordination. The practice of fasting prevails among all alike. They receive and practice the invocation of saints and prayers for the dead, and the use of painted, although not of graven images. Many particulars regarding them are to be gleaned from the memoirs of recent missionaries of the several denominations, among which the letters published from time to time by the French society for the propagation of the faith, are particularly full. For the modern Nestorians, and the Syrian Christians of Travancore, see NESTORIANS.

SYRINGA, a genus of plants of the olive family (order *oleaceæ*). The English name of the genus is lilac (q.v.), and is derived from *ylag*, the Persian for flower. *Syringa vulgaris*, the common lilac, is a native of Persia, Hungary, and the borders of the Danube. Dr. Sibthorp found it wild on mount Hæmus, but not in Greece. It has been long cultivated by the Turks. It is one of the few shrubs that are not injured by the smoke of cities, and it flourishes in perfection in most of the squares of London. It grows very fast, from 20 to 36 in. every year. The Persian lilac, *S. Persica*, is a small shrub from 4 to 6 ft. high, and is one of the most ornamental of low deciduous shrubs. When planted in pots and forced, it may be made to flower at Christmas; but under the circumstances the flowers will lose their ordinary fragrance. There are three varieties of this species in the English nurseries. *S. Chinensis* is a native of China. It is intermediate between *S. vulgaris* and *S. Persica*. It grows vigorously to a height of from 10 to 12 ft. The *lilas de Marty* and *lilas Sangé* are varieties. *Syringa* is also a name improperly applied to the mock-orange or Philadelphus (q.v.).

SYRINGE (Gr. *syrix*, a pipe), a hydraulic instrument, consisting of a cylinder of metal or glass, having a conical nozzle at one end, and the other fitted with an air-tight piston. The nozzle being inserted in a liquid, the retraction of the piston draws the liquid into the cylinder, on the principle of the pump (q.v.), and by its forward pressure the liquid is expelled from the nozzle in the form of a jet.

SYRINX (Pans-Pipes), a simple instrument of reeds, probably the most ancient of all musical instruments. It is thought to be identical with the Hebrew Ugab, mentioned in the Bible. It is known in China with twelve tubes of bamboo, and in Peru it is made of cane, or soapstone. It is seen in ancient MSS. and on bas-reliefs. The Greeks supposed it to have been made by the god Pan out of reeds. It was formed of seven, eight, or nine short hollow reeds cut in graduated lengths, so as to produce a musical scale, and then fixed together by wax. The lower ends of the reeds were closed and the upper ones open and on a level, so that the lips could easily pass from one pipe to another.

SYRRHAPTÉS, a genus of birds of the grouse family (*tetraonidæ*), of which only one species is known (*S. Pallasii*), a native of the deserts of Tartary, abundant in the neighborhood of lake Baikal. From its peculiar characters, which led Pallas to call it *tetrao paradoxus*, it has received the somewhat pedantic name of *heteroclitæ grouse*. (A word is called *heteroclitæ* by grammarians which departs from the ordinary forms of declension.) The legs and toes are short, and densely feathered; and the toes are joined together for the greater part of their length. The bird walks with difficulty, but flies very well, although in general only for short distances. The wings and tail are very long, terminating in remarkably long, slender, pointed plumes.

SYRTIS MAJOR and **SYRTIS MINOR**, the ancient name of two gulfs of the Mediterranean sea, on the n. coast of Africa. The former (now called the *gulf of Sidra*) lies between cape Mesurata, in Tripoli, and the table-lands of Barca, and forms the most southern part of the Mediterranean. The latter (now called the *gulf of Cabes*) lies to the n.w., between Tunis and Tripoli. The shores of both are inhospitable, and abound in quicksands, which, carried by the wind, are said by the ancients to have frequently overwhelmed ships, and the reports of modern travelers to some extent confirm these old traditions. Their waters are (or were) dangerous to sailors, on account of the shallows, sand-banks, and sunken rocks that abound in them. The name Syrtis is derived from an Arabic word *sert*, meaning a desert.

SYRUP, *sirup*, *sherbet*, and *shrub* are all derived from the Arabic *srb*; the first through the Latin, the second through the Persian, and the third through the Hindu.

Syrup, in its simplest meaning, is a saturated solution of sugar boiled to prevent fermentation; but it also means the juice of fruits saturated with sugar, and many flavored liquids treated in the same way. Generally speaking, the finest refined sugar is used; and every effort is made to get the syrup very clear and free from all feculent matter. Syrups of fruits are much used on the continent to mingle with water for drink, and are very wholesome. They are also used in America, especially as flavorings for soda water, there being many varieties of syrup.

SYSTYLE, an arrangement of classic columns in which the intercolumniation is equal to twice the diameter of the column.

SYZРАН', a t. of central Russia, in the gov. of Simbirsk, on the right bank of the Volga, 80 m. s. of Simbirsk. It owes its foundation to its advantageous commercial position on the Volga, and in the middle of a district teeming with agricultural produce. Large quantities of corn are exported. Pop. '94, 30,229.

SZABADKA. See THERESIOPEL.

SZARVAS, a t. of Hungary, in the co. of Bekes, on the Körös, 80 m. s. e. of Budapest. It has a considerable trade in corn and cattle. Pop. '90, 24,393.

SZATMAR-NEMET, a t. of Hungary, on the Szamos, 68 m. n. e. of Debreczin; pop. '90, 20,736.

SZECHENYI, ISTVÁN, Count, 1792-1860; b. Vienna, of a noble and wealthy Hungarian family. He served in the Austrian army in the wars with Napoleon, and afterward traveled through Europe. Clearly seeing the great need for reform and advance in the material and social status of the Hungarian people, he gave liberally of both time and money in bringing this about. Among his acts were the endowment of the Hungarian academy; the founding of a society for improvement in horse-breeding, a most important occupation in Hungary; and the establishment of schools of acting and music. To his exertions were due the erection of the great suspension bridge between Pesth and Ofen, the removal of obstacles to navigation at the "Iron Gates," and the introduction of steamboats on the Danube. He became minister of public works. He opposed the revolutionary measures of Kossuth, and when the revolution of 1848 broke out, became insane, and though he recovered, continued to reside at the Döbling asylum, where he committed suicide after a domiciliary visit by the Austrian police.

SZE-CHUEN (Four streams), a vast province of western China, and the largest of the 18. It has an area three times greater than that of England, but the population is scanty. The Kincha-Kiang, or "Golden sanded river," which rises in the southern slopes of the great Thibetan range, flows through Sze-chuen, and after receiving several tributaries, it becomes, before leaving the province, the famous Yang-tse-Kiang. In its course it passes, at right angles and by narrow gorges, through a succession of ranges of hills, which have a direction from n. to south. The people of Sze-chuen cannot always force a subsistence from their stubborn soil. Famines are not uncommon, when whole families are starved to death, and thousands subsist on a mixture of rice, roots, and common earth. Coal is abundant, but of inferior quality. Salt is evaporated from brine. There is some petroleum; and opium, tea, silk, and tobacco are among the products. Area, 166,800 sq. m.; pop. '82, 67,712,897.

SZEGEDIN, is the second largest town in Hungary, but it was almost completely destroyed by a terrible flood in Mar., 1879. In this hardly paralleled catastrophe, of the 7000 houses of the city, only 350 were left standing. The ruin to property was immense; the loss of life was given at 2000. Szegedin is situated upon the low ground where the Theiss is joined by the Maros, 118 m. s.e. of Budapest. It manufactures great quantities of soda, soap, coarse cloth, etc., has the largest wharves on the Theiss, and carries on an extensive trade in wood, corn, wine, tobacco, and salt. Its markets rank next to those of Pesth and Debreczin. Pop. '90, 87,210.

SZEGSZARD, a t. of Hungary, capital of the county of Tolna, near the right bank of the Danube, 80 m. s.s.w. of Pesth. Here excellent red wine is made. Pop. '90, 14,325.

SZENTA. See ZENTA.

SZENTES', a market t. of Hungary, 28 m. n.e. of Szegedin, near the left bank of the Theiss. The commune contained (1890) 30,758 inhabitants, who are chiefly engaged in the wine culture.

SZOLNOK', a t. of Hungary, on the Theiss, 66 m. e.s.e. of Pesth. It contains important salt magazines, and is the center of the traffic by steamers on the Theiss, and an important railway station. Pop. '90, 20,748.

SZOLNOK DOBOKA, a co. in Hungary, bounded on the s.e. by Transylvania, within which it was formerly included, drained by the affluents of the Szamos river; 1985 sq. m.; pop. '90, 217,550. The surface is mountainous and well wooded. The soil in the valleys is fertile. The principal productions are corn, rye, oats, tobacco, and wines. Capital, Des.

T

T, THE twentieth letter of the English alphabet, is the sharp or mute of the lingual series, *t*, *d*, *th* (*dh*). It is produced by pressing the fore-part of the tongue against the front of the palate. The name in Shemitic (*Tau*) signifies a mark (in the form of a cross.) The Shemitic tongues had another *t*-sound, which became the Greek *θ* (*th*). This aspirated *t* is wanting in Latin and its derivatives; it is also foreign to high-German, although the Gothic and other low-German tongues (English) possess it. The Gothic *th* has become in high-German *d*. In the *spelling* of high-German, *th* occurs not unfrequently; but it is never pronounced, and the introduction of it being considered by students of the language an aberration, there is a tendency to drop the *h*. There is evidence that in Latin, at an early period, *t* before *i* was sibilated so as to sound like *ts* or *z*. See letter C. Before *s*, *t* was frequently dropped; as *fons* for *fontes*, *sors* for *sortes*. Final *t* was in Latin pronounced but faintly, and inscriptions show that in popular speech it was often dropped; e.g., *fecce* for *fecit*, *vixse* for *vixit*. Thus the modern Romanic languages have inherited the loss of the pronominal ending *t* from their common mother. In French, *t* between two vowels has been elided; as *père mère*, from *pater, mater*. In the corresponding words of the allied languages, *t* is often interchanged with other letters. T in Sanskrit, Greek, and Latin becomes *th* in Gothic and English, and *d* in high-German; thus Lat. *tres* (Sans. *trayas*), Goth. *thraiss*, Eng. *three*, Ger. *drei*; Lat. *tectum* (Gr. *tegos*), Goth. *thak*, Eng. *thatch* or *thack*, Ger. *dach*; Lat. *frater*, Goth. *brothar*, Eng. *brother*, Ger. *bruder*. In German, the *t* of the English is often represented by *z*, as Eng. *two* = Ger. *zwei*; Eng. *toll* = Ger. *zoll*; while German *t* or *th* becomes Eng. *d*, as Ger. *tag*, *thau* = Eng. *day*, *dew*. A more remarkable interchange is seen in Lat. *lacrima* = Eng. *tear*. See PHILOLOGY.

TAAFE, COUNT EDWARD FRANCIS JOSEPH, in the Austrian peerage, and Viscount Taafe of Corren, and Baron of Ballymote, Sligo, in the Irish peerage, was b. at Prague, Feb. 24th, 1833. He was brought up in companionship with the present Emperor Francis Joseph. The Count is a descendant of that powerful nobleman of the name who proceeded from Ireland and made a great name in the Germanic Empire. He was appointed Governor of Salzburg in 1863. In 1867 he became Austrian Minister of the Interior and Vice-President of the Cisleithan ministry. In 1869-70 he served as Minister President. In 1871 he accepted the office of Governor of the Tyrol and Vorarlberg. In 1880 he was summoned to form a new cabinet, over which he presided until 1893. The distinguishing feature of Count Taafe's Clerical and Federalistic administration has been to give greater weight to the Slav nationalities, especially the Czechs and the Poles, as well as to the Clericals, in the public affairs of the Empire; and to conciliate the divergent nationalities comprising the kingdom. He d. Nov. 29, 1895.

TABANIDÆ, a numerous family of dipterous insects, of the section *proboscidea*, which live by sucking the blood of horses, oxen, and other animals, and are popularly known by the name of GAD-FLY, which, however, is often given also to some of the *æstridæ* (see BOT). The insects called cleg (q.v.) are of this family. The proboscis is exerted, and is generally terminated by two lips; the palpi are also exerted; the antennæ are three-jointed, the third joint consisting of a number of rings. The tabanidæ fly with a buzzing noise. They are very annoying to cattle in the end of spring and early part of summer; and where they abound, the skins of cattle are often streaked with blood from their bites. The LARGE GAD-FLY (*T. bovinus*) is more common in some parts of the continent of Europe than anywhere in Britain, and is rarer in Scotland than in England. Some of them inhabit the deserts of Arabia and Africa, and attack camels in prodigious numbers.

TABARD (Fr. *tabarre* from *tabardum*, low Lat.), a military garment in general use in the latter half of the 15th and beginning of the 16th c., which succeeded the *Jupon* and *Cyclas*. It fitted closely to the body, was open at the sides, had wide sleeves or flaps reaching to the elbow, and displayed the armorial ensigns of the wearer on the back and front, as well as on the sleeves. About the middle of the 16th c., the tabard ceased to be used except by the officers at arms, who have down to the present time continued to wear tabards embroidered with the arms of the sovereign.

TABASCO, a state in s.e. Mexico; bounded on the n. by the gulf of Mexico, on the e. by Campeachy, on the s. by Chiapas and Guatemala, and on the w. by Vera Cruz; drained by the Tabasco, the Usumasinta, and other streams; 10,072 sq. m.; pop. '95, 134,794. The surface is mostly low and level, with a large area of marsh. The climate is very hot and unhealthy. Mahogany and other valuable woods abound. The principal productions are rice, tobacco, coffee, sugar-cane, pepper, indigo, and honey. Capital, San Juan Battista.

TABASHEER, a substance sometimes found in the cavities or tubular parts of the stems of bamboos and other large grasses. It consists chiefly of silica, with a little lime and vegetable matter, or sometimes of silica and potash, in the proportions of about 70 parts of silica and 30 of potash. It appears to be formed by extravasation of the juices of the plant, in consequence of some diseased condition of the nodes or joints. It is in

high repute among the Hindus as a tonic, and is prepared by imperfect calcination and trituration.

TABBY, or **TABBYING**, another name for watering fabrics. See **MOIRE**. It is usually applied to stuffs or worsted cloths instead of silks.

TABERNACLE (Heb. *Ohel Moed* = tent of meeting, *scil.*, between God and man; **LXX.** *Skene*, Vulg. *Tabernaculum Fœderis*), or, more fully, "tabernacle of the congregation," was the tent first erected by Moses in the desert as a visible symbol of the divine Presence in the midst of the people. It was the place where he went to receive his inspirations as their representative when they "came to seek Jehovah." A cloudy pillar descended and stood at the door of the tabernacle while "the Lord spake to Moses." The detailed description of the tabernacle contained in **Ex. xxv. seqq., xxxvi. seqq.**, renders more than a brief outline superfluous in this place. Suffice it to mention that it was divided into the "sanctuary" proper—which formed the front part, and the dimensions of which were 20 cubits in length, 10 in width, and 10 in height—and the "holy of holies," which was 10 cubits square and 10 high. A kind of court-yard, formed by curtains suspended between columns, ran round the tabernacle, 100 cubits long and 50 wide. The entrance was toward the east—the rising of the sun—and closed by another costly curtain, into which, like unto the first covering, figures of "cherubim" were woven. The surrounding court was much larger on this eastern than on the western side, for here it was that the people assembled for the purpose of worship. Here also stood the altar, made of acacia-wood, upon which a perpetual fire was kept burning, and the brazen laver. The *sanctuary* contained the gilded table with the showbread to the right, the golden candlestick with the seven branches to the left, and between both the "golden altar," or the "altar of incense," upon which the high-priest burned incense in the morning and evening. In the holy of holies, the holy ark, or ark of the covenant, alone was kept; a box of acacia-wood, plated with pure gold both in and outside, containing the two tables of the Ten Commandments. On the top of it were the two cherubim, their faces turned toward each other; and between them there was the symbolical presence of Jehovah (the Shechinah), to which Moses appealed for guidance.

Only once a year, on the Day of Atonement, the high-priest was allowed to enter the holy of holies, while the sanctuary was the ordinary place of the priests, and the court that of the Levites. The tribe of Levi was also that to which the place nearest to the tabernacle, around which the 12 tribes were grouped, was assigned, as it also was the duty of its members to convey the building from place to place during the migrations.

The tabernacle, after the people had settled in Canaan, was erected at Shiloh, where it was still found at the time of Saul, although the ark of the covenant itself had been carried away by the Philistines, in the time of Eli, and when restored, placed at Kirjath-jearim. Nor was the tabernacle of Shiloh the only sanctuary, as it was intended to be. We find other local sanctuaries with priests—at Bethel, Nob, Sichem, Mizpah, etc.—at which even Samuel worshiped, as in legally instituted places. When David is reported to have removed the ark from Kirjath-jearim to Jerusalem, nothing is said about the tabernacle of Shiloh; on the contrary, David erected a new one on purpose for the ark. It seems probable that it was removed at some time or other from Shiloh to Nob, and thence to Gibeon, from whence Solomon seems to have fetched it away, with all its vessels, thus putting an end to the double worship that under David had divided the faithful between Gibeon, where Zadok officiated, and Jerusalem with Asaph's worship. Nothing is further known of the tabernacle, which, besides being a symbol of God's presence, had also served the purpose of a visible political and religious link between the tribes. As a safeguard against idolatry and unlimited sacrificial worship, however, it did not prove effective enough.

TABERNACLE, (Lat. *tabernaculum, armarium*), in the Roman Catholic church, is the name given to the receptacle in which the consecrated elements of the Eucharist are retained. The name is derived by analogy from the tabernacle of the old law, and in form the Roman Catholic tabernacle bears a general resemblance to the Jewish original. By the present discipline, the tabernacle is commonly a small structure of marble, metal, or wood, placed at the posterior part of the altar, and of costly material and workmanship. Even when the exterior structure is of marble or metal, there is commonly an inner receptacle of wood (properly cedar), lined with silk. The tabernacle is appropriated exclusively to the reservation of the Eucharist, and it is prohibited to keep within it any other object, however sacred, as the chrism, relics of saints, the altar vessels, etc. A lamp is constantly kept burning before the tabernacle, which is ordered to be kept at all times carefully locked, the key being retained by the clergy, to whom it is forbidden to intrust it to any lay person, even the sacristan or other official of the church.

TABERNACLES, FEAST OF (Heb. *Succoth*, **LXX.** *Heorte skenon*, Vulg. *Feria tabernaculorum*), a Hebrew feast of seven days' duration, beginning on the fifteenth day of the seventh month (Tishri), and instituted principally in memory of the nomad life of the people in the desert, and the booths or tents used on their march. Besides this signification, it also had an agricultural one, like the other two pilgrimage festivals, the passah and the feast of weeks. It was emphatically the feast of "ingathering"—i.e., the close of the labors of the field—the harvest of all the fruits, of the corn, the wine, and

the oil. During this feast, the great bulk of the people were enjoined to dwell in booths, which we learn from Nehemiah viii. 15, were made of olive, pine, myrtle, palm, and other branches, and were erected on the roofs of houses, and in the courts and streets. The scriptural injunction, to take trees and "boughs of goodly branches of palm trees," etc., was by tradition explained to mean a bunch made of palm, myrtle, and willow branches, and the esog-fruit, a species of citron which the faithful carried in procession during these seven days in the temple; while those who did not visit the temple only said a benediction over it on the first day. The Sadducees and Karaites, however, demurred to this explanation, taking the passage merely to refer to the construction of the booths. Special sacrifices, and a greater number of burnt-offerings than on any other festival, were offered up on this; and on it also the law was to be read to the people every seventh year. It was emphatically called *the* festival, and was the most joyous of them all. There was especially, during the time of the temple, the "joy of the libation," consisting of the priest's fetching, during the morning sacrifice of each day, water from the well of Siloah, and pouring it out, with the accompaniment of music and hymns. There was further a grand illumination in the evening in the court of women, which is said to have lighted up the whole city of Jerusalem; and during and after which, dancing and singing took place. On each day the trumpets were sounded 21 times. At the end of the seven days' joy, an eighth day of solemn rest was celebrated, which was perfectly distinct from the other days both in its sacrifices and in its general service. The bunch was laid aside, the booths were relinquished, and a sin offering—in expiation of transgressions that might have taken place during the hilarity of the previous feast-days—was slaughtered.

Three distinct times we find the inauguration of the temple celebrated on this important festival, by Solomon, Ezra, and Judas Maccabæus, although with regard to the festival itself it would seem from Nehemiah viii. 17, that it never had been properly celebrated before the exile. The observances of the booths and the harvest-bunches are still in force with the strict adherents of traditional Judaism, although the agricultural signification of the festival to them can only be a historical or poetical reminiscence. It has been well observed of old, that no festival could have been more apt to inculcate the fundamental principle of Judaism—viz., the equality of all men, than this, which enjoined that every one should live for a time in primitive dwellings, without distinction of rank, or station, or fortune, and should rejoice in the fruits of the last harvest on the hallowed spot, together with the whole people of the land, "before the Lord."

TABERNÆMONTANA. See COW-TREE and FORBIDDEN FRUIT.

TABES DORSALIS, an affection of the nervous system, now known in medicine as *locomotor ataxy*. *Tabes dorsalis* was so named by Romberg of Berlin; but Dr. Todd of London in 1847 first recognized its true nature, and specially insisted on the distinctions to be drawn between *tabes dorsalis* and *paraplegia* (see PARALYSIS). The name of *locomotor ataxy* was first applied to the affection by Dr. Duchenne of Paris. It is characterized by a want of power in harmonizing the action of certain muscles, the absence of such co-ordinating power being first apparent in the lower extremities, and the gait in consequence being straggling and unsteady. True paralysis is absent, but sensitiveness is diminished, and neuralgic pains are present in the legs and feet. The loss of power progresses, and the later stages of the malady are marked by such symptoms as disordered vision, incontinence of urine, and exhaustion. The duration of this disease varies. It may run its course in a few months, or be prolonged over years. The *etiology* or *causes* of *tabes dorsalis* are still obscure. Mr. Lockhart Clarke has shown that a peculiar change in the posterior columns of the spinal cord, and in the posterior or sensory roots of the spinal nerves, accompanies this disease. Prolonged exposure to cold and damp, drunkenness, sexual excesses, masturbation, and like causes have been credited with inducing the disease. It is alleged to be more common in males than in females, and subjects between the ages of 30 and 50 are said to suffer most frequently from its attack. The characteristic movements in *tabes dorsalis* are worthy of note. The patient has an unsteady gait, and walks like a drunken person, but soon recovers his bearing in some degree. A difficulty in carrying out the intents of the will is experienced, and in picking up an object one hand is employed to steady the other. When the eyes are shut, the patient walks with extreme difficulty. *Tabes dorsalis* may be distinguished from disease of the cerebellum by the absence of the characteristic pain at the back of the head, and vomiting. The *prognosis* of *tabes dorsalis* is very unfavorable. Its progress may be retarded, but the prospect of ultimate cure is well nigh hopeless. The *treatment*, as may readily be understood, is limited to the improvement of the general health, rather than to any specific remedies. Warm clothing, nutritious food, and rest are the chief items in the course of treatment prescribed for this disease; while opiates are indicated for the relief of the neuralgic pains. Sulphur baths have been prescribed in the earlier stages to relieve the numbness, and attention requires to be paid to the bowels with a view of alleviating constipation.

TABINET, a rich kind of cloth, chiefly used for window-curtains. It consists of a warp of silk and a weft of wool-yarn, of the same kind as that used in making poplin. It has the appearance of a fine damask, and is usually enriched with diaper patterns.

TABLETURE, a method of notation used in the 15th and 16th centuries. Its name is derived from the Latin, a table, or flat surface. At first it was chiefly employed for the lutes and viols. Various systems of writing in Tablature were in use at an early date, traceable directly from the gamut of Guido d'Arezzo, but without the stave. The more modern Tablature was arranged in the 16th century. Its general character was the same in Germany, England, France, Spain, and Italy, though each nation had variations which subsequently resulted in a diversity of notation. The methods became so complicated that treatises were written upon the subject. Among these were *Brieve et facile Instruction pour apprendre la Tablature* (Paris, 1551); *Musica Instrumentalis*, by Agricola (Wittenberg, 1529); and *Musick's Monument*, by Thomas Mace (London, 1676). See Mendel's Lexicon, Grove's *Dictionary of Music and Musicians*, and Stainer and Barrett's *Dictionary of Musical Terms*.

TABLEAUX VIVANTS (i.e., living pictures), representations of works of painting and sculpture, or of scenes from history or fiction, by living persons. They are said to have been invented by Mme. de Genlis, when she had charge of the education of the children of the duke of Orleans. They have long been common in theatres, and have more recently become an amusement of private circles. In an æsthetic point of view they are highly commendable.

TABLE D'HÔTE (Fr., "landlord's table") was a name originally used in France to denote a dinner at which the landlord of the inn was accustomed to preside. At the present day it is applied to a full dinner served in courses; used especially with reference to such a dinner served in a hotel or public dining-room.

TABLE-LANDS, or **PLATEAUS**, are extensive plains at a considerable elevation above the sea, whose boundaries are either ranges of mountains much higher on the side away from than on the side next to the table-lands; or steep acclivities, sloping from the level of the plateaus to the surrounding country. They are often traversed by mountain chains, and occasionally even lose the character of plains altogether, being mere conglomerations of hills. The chief table-lands are in Europe, central Spain; in America, the Oregon territory, the great salt plain of Utah, the north and center of Brazil; in Africa, the interior of Barbary; while in Asia, almost the whole of the south and center of the continent consists of plateaus, which rise terrace above terrace till they culminate in that of Thibet. Of the Asiatic plateaus, the principal are: that of Asia Minor (3,280 ft. above sea-level), Armenia (7,000 ft.), Persia or Iran (3,000 ft.), Mysore (4,000-5,000 ft.), Deccan (1500-2,000 ft.), Thibet (12,000-17,000 ft.), and Chinese Tartary (3,000-4,300 ft.). These table-lands are generally accounted for by the supposition of a more extensive and uniform action of the upheaving force than that which produced mountains; and satisfactory indications of the former action being quite recent, and long subsequent to the latter, are occasionally discovered.

TABLE MOUNT. See CAPE TOWN.

TABLES, LUNAR, are tabular lists of the values of the elements of the moon's orbit, as planetary tables are those of the elements of the planets' paths; but the term is also occasionally employed to denote the tabulated angular distances of the moon from certain stars at fixed epochs, as given in the *Nautical Almanac* (q.v.). See LATITUDE.

TABLE-TURNING. See ANIMAL MAGNETISM; SPIRITUALISM.

TABOO. See TABU.

TABOR, a celebrated mountain of northern Palestine, rising solitarily in the north-eastern part of the plain of Esdraelon, to about the height of 1800 ft. and commanding the most extensive and probably the most magnificent prospect in the Holy Land. Eastward, the eye catches a gleam of the waters of the Galilean sea, 15 m. distant; while the whole picturesque outline of its deep-sunken basin, of the rolling trans-Jordanic plateau, and the course of the sacred river itself, is clearly traceable; westward, stretch away into the dim horizon the rich plains of Galilee, rising up into the dark-green ridges of Carmel, overhanging the Levant; on the north and north-east, the snow covered heights of Hermon (see LEBANON) glitter pale over the intervening hills; while to the south, the view embraces the fatal heights of Gilboa and the confused landscapes of Samaria. Tabor itself is at present thickly clad with forests of oak, pistacias, etc., the haunt of wolves, wild-boars, lynxes, and various kinds of reptiles. Its beauty alone would be sufficient to insure it distinguished mention among the mountains of Palestine, but it owes its celebrity even more to its having been regarded from an early period as the mount of Transfiguration. This opinion, however, is now all but universally abandoned, as there is strong evidence of its summit having been then occupied by a city; and travelers are disposed to look for the scene of this supernatural incident further north, in the neighborhood of Hermon. In the times of the crusaders, Tabor was studded with churches and monasteries, relics of which, as well as of Roman and Saracenic structures, still remain.

TABOR, a small drum, played with one stick, in combination with a fife. It was formerly used in war, but has now given place to the kettle-drum.

TABORITES (a sect of the Hussites in Bohemia) derived their name from their fortress of Tabor, near the river Luschnitz, an affluent of the Moldau, 49 m. s.s.e. of Prague. There is now a small town at the place, which had a population (1890) of 8440, and carries on

some woollen manufactures, etc.—The first leader of the Taborites was John Ziska (q.v.) of Trocynow. Under him was Nicolas von Hussinecz, who repelled the imperial army from Tabor in 1420. The Calixtines, desirous of the peace of the country, offered the throne of Bohemia first to king Ladislas of Poland, then to the grand duke Witold of Lithuania, and afterward to his brother Coribut. Ziska refused his consent, and thus these parties became completely separated. In the years 1420 and 1421 both of them set forth their creed in a number of articles. The Taborites absolutely rejected all ordinances of the church not expressly appointed in the holy Scriptures. Both parties were united by common danger in opposition to a common enemy. In 1422 Ziska defeated the imperialists at Deutschbrot, and thereafter met with uninterrupted success in a number of minor conflicts; and in 1424 Prague was saved from destruction only by submitting to hard terms of peace. After Ziska's death, Procop (q.v.) the Greater, or Procop Rasa (the Shaver), and Procop the Less were the leaders. In 1427 and in 1431 they gained great victories at Miess and Tachau over the mercenary crusaders of the German empire, and till 1432 their incursions were the dread of the neighboring countries. The council of Basel, finding them still unconquered in 1433, proceeded to treat with them; and the Calixtines entered into an arrangement, known as the *Prague compact*, which, however, was despised by the Taborites and the Orphans, as that section of the Taborites who considered Ziska as irreplaceable, had come to be termed. The Taborites and Orphans were completely defeated at Böhmisschbrot on May 30, 1434, by the now united forces of the Roman Catholics and the Calixtines. In the treaty of Iglau in 1436, the emperor Sigismund confirmed the compact, and promised religious and political liberty. The civil war, however, continued till king Ladislas in the diet at Kuttenberg, in 1485, established a religious peace, securing both Roman Catholics and Calixtines in their possessions. The Taborites were eventually lost in the sect of Bohemian Brethren (q.v.), which arose from among them.

TABRIZ (pronounced and frequently written *Tabreez*), a great and ancient city of Persia, capital of the province of Azerbaijan, 40 m. e. of lake Urumiah, and on the Aji, which flows s.w. into that lake. The town is surrounded by a ditch and a brick wall, pierced by 7 gates. It forms an oblong of gardens and houses, 2½ m. long; stands 4,000 ft. above sea-level, but nevertheless has the appearance of being shut in by mountains. The streets are broader and cleaner than in most eastern cities, but they are flanked as usual by the pits from which the earth required for their houses was taken; the houses are infested with noxious insects; and the bazaars are roofed with sticks, and are dark and dirty. Water, however, is comparatively plentiful. The chief buildings of Tabriz are not specially striking. Perhaps the principal architectural feature of the town is the fine ruin, Kabūd Masjid, or "blue mosque," about 300 years old, and in part covered with blue tiles beautifully arabesqued. The citadel is a spacious edifice of burned brick, the walls of which, however, have been cracked in many places by earthquakes. Tabriz is the seat of a varied industry, in which leather, arms, shawls, tobacco, and silk manufactures, and gold and silver smiths' work alone are of importance; recently it has also become the emporium of an extensive trade, the exact value of which, however, is not known, owing to the careless manner in which the custom-house officials transact their business, and to the prevalence of smuggling.

Tabriz, the ancient *Tauris*, became the capital of Tiridates III., king of Armenia, in 297 A.D., and was probably at that time an old city. In 791 A.D. it was enlarged and greatly embellished by Zobaidah, the wife of Harūn-er-Rashid. In 858, and again in 1041, the city was devastated by an earthquake. It was taken and sacked by Timur in 1392, and was soon after seized by the Turkomans, from whom it was taken by the Persians in 1500. In 1721 it was again visited by a dreadful earthquake, and on this occasion 80,000 persons are said to have perished. It has been several times in the hands of the Turks, but was finally taken from them by Nadir shah in 1730. Tabriz is a city of Turks, and Turkish is the language spoken. Pop. estimated at 180,000.

TABU, **TAPU**, or **TAMBU**, a Polynesian term, denoting an institution found everywhere, and always essentially the same, in the Polynesian islands and in New Zealand. Its primary meanings seem to be exactly the same as those of the Hebrew *to'ebah*. This word, like the Greek *anathema*, the Latin *sacer*, and the French *sacre* (and the corresponding and similar terms in most languages), has a double meaning—a good sense and a bad; it signifies on the one hand, sacred, consecrated; on the other hand, accursed, abominable, unholy. It results from a thing being held sacred, that certain acts are forbidden with reference to it, and from any act being deemed abominable, that it is forbidden; a notion of prohibition thus attaches to the word tabu, and this is in many cases, the most prominent notion connected with it. The term is often used substantively in the sense of a prohibition, a prohibitory commandment. If a burial ground has been consecrated, it is tabu; to fight in it is then an act sacrilegious and prohibited, and this also is tabu; moreover, those persons are tabu who have violated its sanctity by fighting in it, and they are, loosely and popularly, said to have broken the tabu. This example illustrates all the uses of the word. It has furnished to the English language the now familiar phrase of being "tabooed"= forbidden.

The extent to which, among the Polynesians and New Zealanders, things and acts are tabu, must appear almost incredible to Europeans unaware of the facts of savage life

Without much detail, it is impossible to convey any idea of it. The prohibitions, however, divide into two classes: one consisting of traditional rules, binding upon all, acting through religious terror equally upon chiefs and people; the other, of prohibitions imposed from time to time, obviously with the view of maintaining or extending the authority of the chiefs. Those of the first class are by far the most remarkable. Of the most important of them—those bearing upon what are called sacred things, those relating to the person of the chief, and those relating to intercourse between relatives—a few examples may be given.

Any house or piece of ground consecrated to a god is tabu, and thus affords an inviolable shelter to men fleeing from an enemy. *A fortiori*, all temples are tabu. To sit upon or to touch the threshold of a temple is tabu to all except chiefs of the first order, the lesser chiefs may stride over the threshold, but common persons pass over it on their hands and knees. It is tabu to eat the plant or animal believed to be the shrine of one's tutelary god. To come in the way of a funeral procession is severely tabu, for it is believed that the gods accompany the procession; if any person were to disregard the warning chant of the mourners, they would rush at him and put him to death. Again, to touch the person of a chief is tabu to his inferiors; also, to touch anything belonging to him, to eat in his presence, to eat anything he has touched, or to mention his name. And a chief's threshold is as sacred as that of a temple, and must be passed over in the same manner. It is strictly tabu to touch a dead chief or anything which belonged to him, or any of the clothes or utensils employed in his interment; even those employed in laying out the body pay the penalty of infringing this prohibition. The interdict upon family intercourse varies in extent in different places. In the Tonga islands it was tabu to mention the name of father, mother, father-in-law, mother-in-law; also to touch these relatives, to eat in their presence (unless with the back turned, when constructively the person was not in their presence), or to eat anything which they had touched. In the Fiji islands, generally, it is tabu for brother and sister, first cousins, father-in-law and son-in-law, mother-in-law and daughter-in-law, brother-in-law and sister-in-law, to speak together, or to eat from the same dish. Husband and wife, too, are forbidden to eat from the same dish. In some places a father may not speak to his son after he has passed his 15th year. In an immense number of cases, equally extraordinary, the tabu is used to enforce the prevailing ideas of social propriety. It interferes with cooking, eating, dressing, speaking; scarcely anything is too minute to be regulated by it.

The traditional tabu also supplies to some extent the place of laws and a police. In many places exposed property of some kinds is always under its shelter. In some cases it appears to have been worked in the interest of the priests; thus, certain foods—for example, turtle—are always tabu, and cannot be eaten until a portion has been set aside for the gods. There is a purely superstitious use of it, too, in relation to common things, as when a canoe is made tabu that it may go more safely.

The chiefs have a large discretionary power of declaring articles or actions tabu; indeed, their power is unlimited, but they are expected to keep within precedent. In many cases they use it for purely public purposes—thus, when a feast is coming on they lay a tabu upon pigs and nuts, and other articles, that there may be abundance for the feast. And when a scarcity of anything is apprehended they place a temporary tabu on its use. Speaking generally, any article of food—fish, flesh, fowl, grain, or fruit—may be rendered tabu. A coast, a river, a hunting-ground, may be declared tabu; and then there is an end of fishing, and sailing, and hunting, until the chief has withdrawn the prohibition. The tabu is obviously a powerful instrument of government; and the chiefs are very adroit in using it for their own advantage.

When a man has accidentally infringed the tabu against touching a chief, or a relative, or things immediately connected with him, he is freed from the state of tabu by a ceremony called *moë-moë*; this consists in pressing, first the palms, then the back of the hands, to a superior chief's foot, and afterward washing the hands with water. If a man has accidentally eaten food which a relative or chief has left, he goes through a ceremony called *fōta*, which consists in pressing a superior chief's foot against the stomach. Any breach of the laws relating to sacred places must be atoned for by sacrificing to the offended god. A person, when he is tabu, must not use his hands in feeding himself or in working; were he to feed himself, it is believed that he would die; he must be fed by others until the tabu is removed. In many cases the tabu can only be removed by time. Thus, a common person, who has touched a dead chief, remains tabu for ten lunar months; a chief for four or five months, more or less, according to the deceased's superiority over him. In several cases breach of tabu is punished with death; in many, it involves a sort of outlawry—the neighbors of the offender being free to carry off or to destroy his goods.

It is obvious that the effect of breaking a tabu—at any rate, one effect of it—is to produce uncleanness. The offender has done something unholy, accursed; his hands are not clean; if he has not sinned in the last degree he must make atonement or undergo purification. The chief, holding a divinely appointed rank, recognized as a semi-divine person, descended from the gods, is the medium of purification; he has authority to loose as well as to bind. The offense consists in a thing having been done displeasing to the supernatural powers, for which, it is believed, they will not fail to take

vengeance. It is not, in the general case, an offense against any particular god; nor is the punishment of it looked for from one god more than from another. Tabu is certainly older than most of the Polynesian gods; it must have existed for ages before the mythologies took their present shapes; it might have existed before any name for god had become current. It has no connection with fetishism. The Polynesians do not worship natural objects; their belief that certain plants and animals are the shrines of gods would naturally lead to the worship of those; but, in fact, they merely do not eat the plant or animal which is the shrine of their tutelary god. And though this is enforced by a tabu, the tabu is evidently distinct from the belief in the god's connection with the plant or animal; it is only the means of enforcing that belief—being the customary means used to prevent any act which would provoke a god to anger. The origin of tabu seems to be a vague fear of superhuman powers; this has become associated with certain things and acts; thus practically, tabu is a system of divinely appointed restraints—religion, in the primary sense of the word. The religious horror has attached itself—or, through the policy of priests and rulers, has become attached—to every prohibition supported by a strong expediency; which it is apt to do among rude peoples, especially where the prohibition relates to the family, or to the relation of tribesmen to their chief. It must have been through a long process of construction, carried on by the governing classes—the chiefs and the priests—that tabu became the system it now is. The extensive political application of tabu is sufficient evidence that the Polynesian chiefs have been adepts in the art of turning the religious feelings of their countrymen to their own account.

TABULA RASA was a term used by the Romans for a tablet of wax newly smoothed for writing; hence the term has come figuratively to mean leaving the past behind and starting anew. It is also used to denote the condition of the human mind before it has received any impressions.

TACAHOUT is the name given in Algiers by the Arabs to the small gall formed on the tamarisk tree, *tamariscus indica*. Since the discovery of photography these galls have become of considerable importance as a source of gallic acid, of which they contain a large proportion. The French chemists import considerable quantities; and the same gall, under the name of mahee, is imported for the same purpose by British chemists from India.

TA CAMAHAG, or TACAMAHA'CA, a name which, from the number of its applications, has produced considerable confusion in the history of commercial products. No less than four different resins are known under this designation. One, from Mauritius, is obtained from a tree common in India and its islands, called the poon-wood tree, *calophyllum inophyllum*. Another, from South America and the West Indies, is obtained from *zanthoxylum (fagara) octandra*—this is usually called shell tacamahac. A third, also from South America, is yielded by a tree called *iceia tacamahaca*; it is supposed to be the Mexican copal. And the fourth is from North America, and is the produce of the Carolina or tacamahac poplar; it is collected in small quantities, and has only a small value for supposed medicinal properties. The others are chiefly used for varnishes.

TACCA, a genus of plants of a small natural order called *taccaceæ*, nearly allied to *araceæ*. They are large perennials, with tuberous roots. The species are few, and are found in maritime places and woods in the South Sea islands and the warmest parts of Asia and Africa. Some of them (*T. pinnatifida*, etc.) are much cultivated for the sake of their tubers, which are used as an article of food, although they are acrid, and require maceration in water to remove their acidity, on account of which also they are generally eaten with vinegar, or some acid substance. They contain a large quantity of starch, which is wholesome and nutritious, and is imported into Britain as a substitute for West Indian arrow-root. It is known as *Tahiti arrow-root*. Dr. Seemann says that it is an effectual cure for dysentery, which other arrow-root is not. The boiled leaf-stalks of the plants of this genus are also used in China and Cochin-China as an article of food.

TACHE, ALEXANDRE ANTONINE, 1823-94; b. Lower Canada, educated at St. Hyacinthe college, joined himself to the order of the Immaculate Conception, and in 1843 was ordained at the St. Boniface post of the Red River mission. From this point he traveled great distances toward the n.w. and in Manitoba. In 1850 he succeeded Bishop Provencher, to whom he had previously been coadjutor, and in 1871 he became metropolitan. Archbishop Tache was the founder of the St. Boniface theological college, and wrote books on the subject of his missionary labors in the north-west.

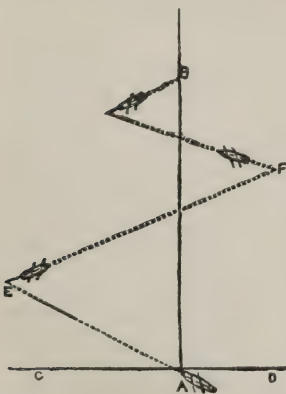
TACITURNITY, in the law of Scotland, is a mode of extinguishing an obligation by mere silence, and making no claim upon it within a long time. It is a distinct ground, and embraces a shorter period than the ordinary prescription of limitation (q.v.); for if a creditor never apply for payment or performance of the obligation, a presumption arises either that there never was such an obligation, or that he has abandoned it. Much depends on the circumstances of each case whether such a doctrine is applicable; and, as a general rule, the periods of prescription are adopted as superseding the common law doctrine of taciturnity.

TACITUS, PUBLIUS CORNELIUS, the historian. Of his parentage, or of the time and place of his birth, we can only conjecture that his father was probably Cornelius Tacitus, a Roman eques, who is mentioned as a procurator in Gallia Belgica, and who died in 79. From the emperors Vespasian, Titus, and Domitian he received promotion and other marks of favor; and in 78 he married the daughter of Caius Julius Agricola. In 88, when Domitian was emperor and Tacitus prætor, he assisted as one of the quindecimviri at the celebration of the *Ludi seculares*. Agricola died in Rome in 83, while Tacitus and his wife were absent; and nothing further is known of the historian till 97, when, in the reign of Nerva, he was appointed consul suffectus, succeeding Tacitus Virginius Rufus, whose funeral oration he delivered. Tacitus had already attained distinction as an orator when the younger Pliny was entering upon public life; and both of them were appointed, in Nerva's reign in 99, to conduct the prosecution of Marius, then proconsul of Africa. Tacitus became one of the most intimate friends of Pliny, of whose letters 11 are addressed to him. The time of Tacitus's death is unknown, but he most probably survived Trajan, who died in 117. His extant works are: (1) *Vita Agricolæ*, written after the death of Domitian in 96, and universally admired as a masterpiece of noble sentiment and pregnant epigram. (2) *Historiæ*, written after Nerva's death in 98, and before the *Annales*, and embracing the period from the second consulship of Galba in 68 to the death of Domitian in 96. Only the first four books have reached us in a perfect state, but there must have been many more. (3) *Annales* commencing with the death of Augustus in 14, and closing with the death of Nero in 68. These also have reached us only in an imperfect state. (4) *De Moribus et Populis Germaniæ*. This treatise is trustworthy only as regards those Germans who were best known to the Romans from their proximity to the Rhine. For the provinces beyond that river it has no value, whether geographical or political. (5) *Dialogus de Oratoribus*, if the work of Tacitus at all, must be his earliest. Tacitus is one of the greatest of historians. In love of truth and integrity of purpose he is equalled by few; in conciseness of phrase and power of saying much and implying more in one or two strokes of expression he is rivalled by none. The best editions are those of Orelli and Halm.

TACITUS, MARCUS CLAUDIUS, about 200–76, A.D. ; b. Interamna (modern Terni), in Umbria; elected emperor after the death of Aurelian and an interregnum of seven months. He began his brief reign of 200 days at the advanced age of 75 years; one of the oldest and wealthiest of the senators. He instituted needful reforms in relation to the coinage and the morals of his subjects; being himself of temperate habit, upright, and honest; giving liberally to the state from his private fortune, and living as simply after his accession to the throne as in private life. He claimed descent from the historian Tacitus, whose works he ordered preserved with care in the public libraries, and copies made every year. He favored the restoration of the power of the senate. His victory over the Scythians is recorded on his coins by the inscription “Victoria Gothi” and “Victoria Pontica.” He died at Tyana, some say of a fever, others by assassination.

TACK, the Scottish law-term, synonymous with lease (q.v.).

TACK—TACKING. The *tack* of a sail is the lower windward corner. The *tack* is the rope employed in hauling down that corner to its proper position. The *tack* of a fore-and-aft sail is its lower forward clue or corner; it also designates the rope for hauling down that corner. A ship is said to be on the *starboard* or *port tack* when she is close-hauled, with the wind on the starboard or port side.



Tacking is the practice of beating up against an adverse wind by a zigzag course. If a vessel at A require to sail due n. to B, and if the wind be either n., or from any point n. of the line CAD, it is obvious that the wind will not carry her directly to her destination. As an extreme case, let the wind be n. or dead against her. By setting her sails obliquely, as at A, it will be possible to beat up in the direction AE. If the master consider that at E he has passed sufficiently from his straight course to B, he will then put his helm a-lee, which brings the ship's head straight to the wind, the tacks of the sails being at the same time set free. The after-sails are then smartly braced over to the opposite side, and the ship's head falls off from the wind in an opposite direction to that previously held, until the course is EF. This process is repeated on each side of the line AB, until at length the ship makes her port, B. The length of each tack, as EF, is called a *board*. When the wind is straight ahead, as in the above example, the several boards should obviously be equally on each side of the line AB. If, however, the wind were not so direct, it would be necessary that the boards in one direction should be shorter than those in the other. Sometimes, from the nature of the channel, as an estuary, etc., it is necessary to take a long tack one way, say to starboard, and a very short one to port. This is known as “sailing with a long and a short leg.”

TACKING OF MORTGAGES, in the law of England, is a practice that sometimes occurs in the course of mortgage securities, when one person acquires more than one mortgage over the same estate. Thus, though mortgages, according to the general rule, rank according to the order of date, yet, if a third mortgagee, who became so without notice of a second incumbrance, purchase the first mortgage even after notice of the second mortgage, so as to require a legal title, and if he holds them both in his own right, he can tack the one to the other, and so obtain priority for the third mortgage over the second mortgage. This is on account of an old technicality, scarcely intelligible to other than lawyers.

TACNA, a province, formerly of Peru, but now, provisionally, belonging to Chile. There is some agriculture, and a few mines occur. Area, 8685 sq. m. Pop. '94 (estimated), 32,191. **TACNA**, the capital of the province, is situated on the Tacna river, about lat. 18° s. The Chileans defeated the combined armies of Peru and Bolivia here, May 27, 1880. Pop. '90, 14,000.

TACOMA, city and co. seat of Pierce co., Washington, on Commencement bay, at the s. extremity of Puget sound and at the mouth of the Puyallup river, and on the Northern Pacific railroad; 25 miles n.e. of Olympia. The city has an excellent and commodious harbor; is built principally on a bluff 80 feet above the river and a slope and plateau which reaches an altitude of over 300 feet; and was laid out in 1868, made the Pacific terminus of the Northern Pacific railroad in 1873, became the co. seat in 1880, and became the city of Tacoma by the consolidation of the towns of Old Tacoma and New Tacoma in 1883. The noteworthy buildings and institutions include Puget Sound university (M. E.), Washington college, Annie Wright seminary (P. E.), Pacific university (Luth.), academy of the Visitation (R. C.), Tacoma academy, Public library, Masonic library, Ferry museum of art, Fannie Paddock hospital, St. Joseph's hospital, co. hospital, children's home, seamen's friend society, co. court-house, city hall, railroad office building, chamber of commerce, etc. A few miles s. of the city is the state asylum for the insane. There are Point Defiance and City parks, waterworks owned by the city, electric light and electric street railroad plants, about 65 churches, several national and state banks, and many daily, weekly, monthly, and quarterly periodicals. The U. S. census of 1890 reported for Tacoma 225 manufacturing establishments (since increased to over 300), using a capital of \$7,227,201, and yielding products valued at \$10,433,000. The lumber, coal, grain, and flour interests are large, and the wholesale and jobbing trade extensive. Pop. '90, 26,006.

TACONIC MOUNTAINS, in the co. of Berkshire, w. Mass., and the co. of Bennington, Vt.; running n. and s. on the e. boundary of New York, uniting the Green mountains of w. Massachusetts with the Highlands of the Hudson. They were named from the characteristic strata of the range, a kind of rock (believed to be older than the Silurian system) to which Prof. Emmons gave the name of taconic; attaining a thickness of 30,000 ft. along the Appalachian chain. The formation in various portions consists of slates, sandstones, quartzites, limestones, and iron ore. The highest peak in Vermont is mount Equinox, 2 m. w. of Manchester, 3,872 ft. above the sea; in Massachusetts, mount Greylock, near North Adams, 3535 ft. in altitude.

TACONIC SYSTEM, an extensive series of rocks in the United States, described by Dr. Emmons. They consist of two divisions, the upper having a thickness of 25,000 ft., and containing lower Silurian fossils; and the lower, with 5,000 ft. of thickness, in which, as yet, no fossils have been found, but which is generally considered to be the equivalent of the Cambrian rocks of Britain.

TACTICS (MILITARY). Strategy (q.v.) is the art of manœuvring armies with reference to the objects of the whole campaign—the securing of communications, the cutting off an enemy from his base, throwing him into a position where he must fight at a disadvantage, retreat or surrender. Tactics are the evolutions of an army in the actual presence of an enemy. In the earliest records of battles are those of mere single combats, in which the chiefs, fighting either on foot or in chariots, performed great deeds; and the commonalty, who apparently were without discipline, were held in profound contempt. With the growth of democracy arose the organization of the phalanx (q.v.), the advance of which was irresistible, and its firmness equally so if charged in front. It, however, changed front with great difficulty, was much deranged by broken ground, and failed entirely in a pursuit or if attacked in flank. Far lighter and more mobile was the Roman legion (q.v.). Among Roman tactics was also the admirable intrenchment, which they scarcely ever omitted as an additional source of strength.

Later in the feudal period, this disparity between knight and footman was diminished by the employment of bodies of archers. The adoption of gunpowder for small arms altogether neutralized the superiority of the armored knight. This change brought infantry into the front place in battle and threw cavalry into the status of an auxiliary. The French revolutionary wars tended much toward the development of artillery as a field weapon, and Napoleon employed this terrible weapon to its fullest extent, a practice since followed by the best modern generals. Frederick the Great was considered an innovator for fighting with infantry four deep. During the French war the formation of three deep became general.

Rapid-fire guns, magazine rifles and smokeless powders have given a new phase to tactics. The most extensive maneuvers under modern conditions have been con-

ducted by the Germans, after whose ideas the new tactics of the United States have been more or less modeled, as well as those of almost all the European armies. In the absence of sufficient war experience it is not possible to decide what influence the adoption of the new devices will have on tactics. Experience on the drill ground warrants the conclusion that, if fresh elements have not been introduced into tactics, still the use of the new explosives will have altered in many particulars the importance of existing tactics. The absence of smoke allows of better aim, and consequently better shooting, and allows of the better employment of the quick-firing arm. A further advantage is in the better leading of the firing troops, the clearer observation of the individual, and of the effect of the fire. Unless required for other reasons, the absence of smoke also allows of the pauses formerly considered indispensable during the period of rapid fire being omitted. On the enemy's side, it prevents his recognizing at once the exact situation of the defensive position to be attacked; in other words, the battle-field is rendered far more open to observation. On the other hand, there will be greater uncertainty in determining the enemy's position than formerly, and the difficulties of command will be enhanced by this circumstance; they demand a higher tactical ability and initiative from leaders of all ranks. The difficulty of recognizing the enemy's position will demand a more thorough reconnoissance, and render the command more than formerly dependent on reports of others. See ENGAGEMENT.

INFANTRY TACTICS.—The fire action begins at far greater distances than formerly; fighting in extended order is the only form adopted, not only for the opening and carrying through of the fight, but also for its decision. Movements of bodies of troops in the vicinity of the enemy's fire are more difficult, and columns must no longer be exposed to it. The extension of front of the fighting troops, no less than the distances between the several lines and the reserves, is increased. Direct advance on the enemy, without his fire having been previously beaten down, will expose the troops to destruction. Frontal attacks without simultaneous pressure on the flanks will not secure any decisive advantage. The deployment is carried out earlier, owing to the increased difficulty of reconnoissance. The spade is more than ever an arm in the hands of the infantry, even during the attack. It may, at the same time, be noted that earthworks, such as shelter trenches, etc., must be given a far stronger profile, looking to the increased penetration of the small-bore bullet. It is indispensable to accustom the troops to fighting at night. A further result of the small-bore arm is that, without any addition to the transport, 360 rounds per man, or 90 more than previously, are carried; of these the soldier carries 140 rounds, the remainder being in the ammunition wagons. It is pointed out that regular musketry training and practice grounds are useful for preliminary teaching; but that good training can only be attained by constant exercises on unknown ground with ball cartridge, the other arms being represented. It is distinctly laid down that definite formations cannot be given for the attack—none are to be adopted as normal formations. Pushing forward of troops in front of the general line of defense, for the purpose of offering temporary resistance, is to be avoided.

CAVALRY TACTICS.—The compact drill and formality in the training of former days, which had in view only inspections and parades, is fast disappearing. Riding in different ground of every kind, exercises under service conditions, by day and by night, exercises with units at war strength assimilated, as far as possible, to what would actually occur in war, have taken the place of repeated riding and drills on the exercise ground. With the insured increase of accuracy in the infantry fire, cavalry has been threatened with a new danger, but its effects upon cavalry tactics have been greatly exaggerated. The clearer view of the battle-field in future will put the cavalry commander in a better position for deciding the most favorable moment for attack. The covering clouds of smoke have hitherto hidden both physical losses and moral defeat, and allowed an enemy to withdraw without exposing himself to tactical pursuit. In reconnoitring duties no material modifications of tactics are called for. The most important information will be derived from the cavalry while the enemy is marching, and, consequently, not shooting. Only when occupying fortified positions it will be necessary for scouts to ride with greater care than formerly. It is the almost unanimous opinion in every army at the present time, that there is a great future for cavalry, in spite of the power and precision of modern guns and rifles. It is self-evident that it can no longer attack, with any hope of success, intact infantry—but neither could it in the days of Frederick the Great and of Napoleon. It is recognized, also, that the conditions of success have become more difficult; but so they have in the same degree for other arms. Open ground at great distances is avoided, covered ground sought and utilized, and the attack is only undertaken when the enemy's infantry has been shaken by fire. Only the simplest formations are now considered possible, as success in attack can only be hoped for by that cavalry which goes most directly to its objective, deploys the most rapidly, and strikes its enemy at the sharpest gallop before being struck itself. The action of cavalry in night fighting is not so limited as might at first sight appear. Ziethen's turning movements, the various enterprises in our civil war, and the Russian cavalry in 1877 prove sufficiently that cavalry in large bodies can be brought up to the enemy in the dark unobserved, even in difficult ground. As regards arms, while the Indian troubles necessitate our cavalry being armed with carbines or rifles of some kind, the reintroduction of the lance for continental cavalry is insisted upon. The

entire German cavalry is now armed with it, and the French regiments are experimenting with it. The swimming of cavalry is made an important tactical feature, with special reference to its bearing on patrol work. It is recommended sending equipments and clothing over by rafts or boats, men and horses swimming over more or less bare.

FIELD ARTILLERY TACTICS.—It has been shown that, though there is still a smoke-cloud with smokeless powders, it is so thin that a skirmish line cannot be seen by it beyond 200 to 300 metres, and though visible with artillery fire at the moment of firing, it disperses at once. Artillery therefore gains the advantages of clear sight, both for observing and laying, and of being much less visible to the enemy, provided it is judiciously posted, so as not to show up on the sky line. Artillery engagements must be more thoroughly carried through than before, until the guns of one side or the other are completely crushed. Even after this has been done, the preparation for attack by artillery fire on selected points of the enemy's position must be more complete than formerly, for the fire effect of unshaken infantry armed with the small-bore magazine rifle and with smokeless powder will be enormous. The intervals between batteries and guns have been materially diminished, so that positions for massed batteries are more easily found. The new tactics founded on the above principles omit many of the formations which were formerly in use, and insist on the complete mastery and precise execution of the few simple formations that have been retained. Open division column, as well as half column, is omitted; the only formations for movement are line at full intervals, battery column of single guns, and, under certain circumstances, division columns. Whereas former regulations were based on the peace battery of 4 guns, the new ones deal with the war battery of 6 guns and the 4 wagons forming the first line. The principles of employment in battle have not changed materially. The instruction is new by which, before advancing into the first position for coming into action, a preparatory position is to be taken up where all the preparations for favoring fire being opened rapidly are to be made. As regards the supply of ammunition, that in the limbers is to be left intact as long as possible. The ammunition wagons of the first line move up to the guns without waiting for the order, and are placed to the rear of the right flank gun of each subdivision. The limbers go to a more retired position in the rear and are joined there by the teams of the wagons. To prepare effectually for the infantry attack individual batteries accompany the advance up to the shortest ranges. In the defence a preparatory position is recommended even when the position is artificially prepared. As a rule the whole of the guns are directed in the first instance on the enemy's guns, and are turned on the infantry the moment it begins to advance, regardless of the artillery fire.

FORTRESS WARFARE TACTICS.—The conditions applicable to a field army really apply equally to fortress warfare, which is now closely assimilated to other fighting, by the changes of position of the fortress and siege artillery. The construction of the Schumann armored towers and armored carriages, of a sufficiently portable character to allow of their employment in the field, is another step toward the conversion of operations in the field into a war of position. Their employment will, it is considered, be followed by the presence with an attacking army of a heavier artillery than that now employed. The movable armored towers are designed for quick-firing guns, and they have been found proof against the existing field guns and even shell from 5-inch howitzers. (See GRUSON SHIELDED MOUNTINGS.) In other tactical directions, comprising the organization of special fortress troops, the development of telegraphs and telephones for perfecting the communications, the use of balloons for observation, and the electric light for searching ground at night, considerable progress has been made.

TACTICS (NAVAL). The matter of tactics in the navy is in a partially experimental stage, as no large number of modern vessels has ever been together at any one time for the purpose of developing tactics. There is a "fleet drill book" issued to vessels in commission, which contains the elements for the building up of a tactical signal book. In this work are given general instructions, the school of the ship, school of the section, school of the division or squadron, and general signals. In the make up of the fleet two vessels compose a section, one being the *leader* and the other the *mate*. Four vessels, or two sections, form a division; eight vessels, four sections, or two divisions form a squadron, and two squadrons a fleet. A naval force consisting of more than sixteen vessels will use the number in excess as the nucleus of another fleet organization. The section on the right is number 1, the next to the left number 2, and so on. If there are two divisions in line, one will be termed the right and the other the left; if in column, the leader is the van and the other the rear. During the day, when cruising in formation, the speed of each vessel is indicated by a black or dark-green ball and a small red and blue pennant, the relative position of which indicates the speed of the engines at any time. At night two white signal lanterns will indicate the speed. There is also a white signal lantern at the main mast head, and another one on the taffrail, so screened as to show only astern.

There are six formations, three simple and three compound. The simple formation are line, column, and echelon, and the compound formations are double line, double column, and double echelon. All compound formations can break into simple formations, and all simple formations, with the exception of the echelon, can pass into compound formations. Echelon formation must always pass into line or column before

being formed in any compound manner. Ship evolutions are all comprised in a circle. They consist of the oblique, half-turn, turn, circle, and figure of eight. Section evolutions are composed of simultaneous movements, where each ship makes the same change of course at the same time; successive movements, where one ship changes course and the next ship follows in her wake; the wheel, where the head of the column is changed, but the relative bearing of the ships is maintained; and direct movements, where each ship breaks the formation and forms another by proceeding to her new formation by the shortest route at the quickest speed. Division evolutions are the same as section evolutions, with the exception that the wheel is supplanted by the conversion, and by *isodromes* or paths of equal lengths.

Squadron evolutions are the same as those used in manœuvring a division. When in line the squadron can arrange itself in an indented manner by alternate vessels dropping to the rear. Vessels in case of accident must immediately haul out of the formation. They are *strictly forbidden to stop*. Under all circumstances vessels will sheer out of line to clear the danger. When steaming in column, single or multiple, the vessel next astern of the leader will keep one-half point on the leader's port quarter, if at half distance, and one-eighth point if at double distance. The third vessel, if at half distance, is to take position one-quarter point on the starboard quarter of the *leader*; if at distance, one-eighth point, and if at double distance, one-sixteenth point. The other even-numbered vessels will be astern of number 2, and the odd-numbered ones astern of number 3. Half distance is 1 cable's length or 200 yards; distance, 2 cables', and double distance, 4 cables'. With *ships' boats*, when at tactical drill, distance is 2 boats' lengths, and double distance, 4 boats' lengths. The length of intervals depends a great deal upon the speed of the force. In two columns the interval is generally 800 yards, or 4 cables; in double line the same; but when the speed is greater than 10 knots this interval is increased.

TACUBAYA, a town of Mexico, 3 m. s.w. of the city of Mexico. It has a castle, a military school and the national observatory of Chapultepec, and is of historic interest. Pop. about 12,000.

TADMOR. See PALMYRA.

TADOUSAC, village, watering-place, and co. seat of Saguenay co., Quebec, Canada; on the Saguenay river; 130 miles from Quebec. It was founded in 1599; was formerly the capital of the French settlements and an important fur-trading post; is believed to have contained the first stone and mortar building elected on the American continent; and still preserves the oldest church in Canada, built 1747. It has several hotels and churches, costly villas, and large salmon and other fish interests. Aside from its antiquity, it is most widely known as a delightful summer resort. Pop. '91, village, 700; parish, 2440.

TADPOLE. See FROG.

TAEL, the name commonly given to the Chinese *liang*, a money of account in China, is now (1896) worth from .724 to .806 of an American dollar, varying in different parts of the empire.

TAE-PINGS, the name given to the Chinese rebels who made their appearance in 1850, and (see CHINESE EMPIRE) desolated some of the best cultivated provinces of China. After the war of 1860 it became the interest of the English, French, and American governments to re-establish order in China. The repulse of the rebels at Shanghai in Aug., 1860 had been followed by several engagements between them and the imperialists, in which the Tae-pings were defeated, mainly in consequence of the re-organization of the imperial army by Ward, an American. In the beginning of 1862 the Tae-pings again advanced on Shanghai, and were twice defeated. In that year Ward was killed; and "Ward's force," handed over to an English officer, took the name of Gordon's brigade. Permission was also granted to Capt. Sherard Osborne to organize in England a small fleet of gun-boats, to ascend the Chinese rivers and re-establish order. Gordon's brigade rendered essential service to the imperial government. The rebels were defeated in upward of 16 engagements; and in 1864 almost every important city was taken from them. Capt. Sherard Osborne's expedition was less successful. He found that the jealousy of Chinese officials would not permit him to take the steps necessary to discharge properly the duty he had undertaken, and he therefore threw up his commission, and returned to England. The conduct of the imperial authorities at Su-chow, where a horrible massacre took place, led to the withdrawal of the English military force; but the rebellion had been effectually checked. They were finally dispersed in April, 1865, when they were routed by the imperial army at Kia-ying-chou in Kwan-tung. In the same year, the Nienfei, or marauders of the north, began to be troublesome. This was a marauding expedition, without political significance, which was dispersed in 1866. See PANTHAYS.

TAFFETA (or Taffetas), a term of somewhat general application in silk-mercery. It was formerly applied to all plain silks simply woven by regular alternations of the warp and weft, and is by some writers supposed to be the first kind of silk-weaving known even to the Chinese, from whom it came to us. Modifications have, however, been introduced, by varying the quality of the warp and weft, and by the substitution of various colors for the single one of the original taffeta. It has therefore become a sort of

generic term for *plain silk*, gros de Naples, gros des Indes, shot or chameleon silk, glace, and many others, and even for some combinations of silk, wool, and other materials.

TAFFRAIL, in a ship, is the rail over the heads of the stern-timbers, extending across the stern from one quarter-stanchion to another.

TAFFY. See NATIONAL NICKNAMES.

TA FIA, a name used in the sugar-producing colonies for a kind of rum distilled from molasses. The term is only in general use in French colonies.

TAFT, ALPHONSO, LL.D., was born in Townshend, Vt., in 1810; graduated at Yale College in 1833, and was tutor for two years; was admitted to the bar in New Haven in 1838, but removed to Cincinnati in 1840; gained an extensive practice, and was Republican candidate for Congress, 1856. In 1865 he was made judge of the Superior Court; in 1875 was a candidate for the Republican nomination to the governorship of Ohio; from Mar., 1876-Mar., 1877, he was Secretary of War under President Grant, and from 1882-85 was successively United States Minister to Austria and Russia. He died in California in 1891.

TAGANROG', an important sea-port of Russia, in the gov. of Ekaterinoslav, on the n. shore of the sea of Azov, 18 m. n.w. of the chief mouth of the Don. It was founded by Peter the Great in 1696, was lost to Russia from 1712 till 1774, when it again reverted to the people who founded it, and since that time it has increased in importance yearly. The port of Taganrog is so shallow that large ships cannot approach within half a mile of the quay, and at this distance from shore they load and unload by the help of barges. There is a trade in timber, hemp, wheat, copper, tar and meat. Pop. '97, 51,748.

TAGLIONI, MARIA, 1804-84; a celebrated *danseuse*, b. at Stockholm, of Italian parents, her father (Filippo Taglioni, b. at Milan, 1777) having been successively ballet-master at several opera-houses in different parts of the continent. Mlle. Taglioni made her *debut* in Vienna in 1818. In Paris (1827) she created a perfect *fuoror*, and was at once recognized as the first of ballet-dancers. Her success was equally great at most of the other European capitals, London included. She married and retired from the stage in 1847, and afterwards resided in Italy and in London, where she taught dancing.

TAGUS (Span. *Tajo*), the largest river of the Spanish peninsula, rises on the frontier of New Castile and Aragon, between the Sierra de Albarracin and the Sierra de Molina, about 45 m. n.e. of the city of Cuenca. It first flows n.w. for about 30 m. to its union with the Gallo, at which point it curves to the s.w., and flows in that direction to Toledo, whence it flows w. to Abrantes in Portugal. From Abrantes the river flows s.w., and, passing Lisbon, enters the Atlantic about 10 m. lower down. At the city of Toledo, it breaks through a romantic rocky pass, the walls of which are upward of 200 ft. high. From Villavelha, 18 m. within the Portuguese border, the Tagus is navigable to its mouth, a distance of 115 miles. Above Lisbon, the river widens like an estuary, being in some places 5 m. broad; opposite Lisbon, however, it is only 1 m. broad. The principal affluents are the Jarama, Guadarrama, Alberche, Alagon, and Zezere from the n. and the Guadiela and Rio del Monte from the south. Total length 566 miles.

TAHITI, or OTAHEITE, the chief of the Society islands (q. v.), is 35 m. long, about 120 m. in circumference, and has an area of 401 sq. m. Pop. about 11,200. The chief town is Papiet, which is the capital of the colony.

TAH'LEQUAH, town and capital of the Cherokee nation, Indian Territory; on the Illinois river, 30 miles from its junction with the Arkansas river; 55 m. n.w. of Fort Smith, Ark. It contains Cherokee national male and female seminaries, several primary schools, special schools for negro children, Baptist and Presbyterian mission schools, several churches, and capitol, and has weekly newspapers, printed partly in English and partly in Cherokee, and railroad communication with points in adjoining states by several trunk lines that have been authorized by Congress to enter the territory and nation. Pop. '90, 1200. See INDIAN TERRITORY.

TAIKO SAMA (the name by which Hidéyoshi Toyotomi is best known to English speaking people); 1536-98; b. in the province of Owari, Japan, of humble parents; when still a boy became a retainer of Nobunaga, and rose to be a general of commanding military genius. He avenged the murder of Nobunaga, humbled Satsuma, and reduced the warring clans to submission. Having tranquilized the native empire, he found employment for his restless armies in invading Corea in 1592. He sent Konishi and Kato into the peninsula with 80,000 men, who in a few weeks entered the capital, overran the eight provinces, and met and defeated the hosts of the Chinese sent to succor the Coreans. Having been in 1586 made regent, he retired in favor of his son in 1591, and hence took the title of taiko (*sama* meaning lord, or sir). He greatly patronized art, stimulated by personal favor the porcelain manufacture, and many other industries, encouraged commerce, and internal national improvement. Compelled to act with a high hand between the rival sects of the Jesuits and Dominicans, and to regulate the foreign relations of Japan, he shipped the European friars from the country, and when they re-

turned, had them hanged. The "age of Taiko" is looked upon with admiration by the Japanese, and his life has been many times written in well-illustrated books, his adventures being standard subjects of Japanese decorative art. His last words, like those of Napoleon, were an order to his troops. On his death the victorious soldiers were recalled from Corea. His successor, Iyeyasu, whose genius gave peace to the empire for over 260 years, followed in the main the policy of Taiko.

TAIL, **ESTATE**, is, in English law, an estate given to A and the heirs of his body, or A and the heirs-male of his body, or some other class of heirs less extensive than the class of heirs-at-law. It was anciently a question whether in such a case A, the father, could defeat the right of the children, and break the entail. In England, it was early decided that A could, by a sham process, called a fine or recovery (q.v.) break the entail; while in Scotland it was otherwise, at least since 1685, the Scotch legislature having legalized a mode of securing the entail, and preventing A, or any of his successors, from breaking it. See **ENTAIL**.

TAILOR-BIRD, *Orthotomus*, a genus of birds of the family *sylviadae* (q.v.), with a long graduated tail, the feathers of which are narrow. The species are numerous, natives of the East Indies and of the Indian Archipelago, and haunt cultivated grounds, where they are commonly seen in pairs. Their flight is rapid and undulating, and they seldom ascend above the lower branches of trees. The name *tailor-bird* is derived from the way in which the nest is formed. Two leaves are taken at the extremity of a twig, and are sewed together by their edges, or a large leaf is sewed together; the necessary holes being made by the bill, and vegetable fibers forming the thread. Within the hollow thus made, a quantity of a cottony substance is placed to receive the eggs.

TAILZIE, the ancient term in the law of Scotland to denote a deed creating an entailed estate. See **ENTAIL**.

TAIN, a royal and parliamentary burgh in the county of Ross, Scotland, on the south shore of the Dornoch firth and 24 miles n.n.e. of Inverness. There is no proper harbor. The most interesting building is a small ruined chapel, remarkably rude and simple in architecture, and said to date from the 13th c., and there is also a collegiate church of St. Duthus, founded in 1360, and restored in 1871-76, and an endowed academy incorporated by royal charter. Brewing and iron-founding are carried on. Pop. of royal burgh (1891), 3085.

TAINÉ, **HIPPOLYTE ADOLPHE**, a French critic, was born at Vouziers in Ardennes, April 21, 1823, and studied at Paris, where in 1853 he obtained the diploma of *docteur ès lettres*, for two essays, *De Personi Platonis*, and *Essai sur les Fables de La Fontaine*. They were followed by his *Essai sur Tite Live* (1854), crowned by the French academy; *Les Philosophes Français du dix-neuvième Siècle* (Paris, 1856); *Essais de Critique et d'Histoire* (Paris, 1857); *Histoire de la Littérature Anglaise* (Paris, 1864); *Philosophie de l'Art* (1865; Eng. transl.); *Notes sur l'Angleterre* (1872; Eng. transl.); and others. In the *Littérature Anglaise* (Eng. transl., Edinburgh, 1872), the author surveys and criticises our whole literature from a point of view which is conceived to be rigorously scientific. According to Taine, there are three things to be borne in mind when writing the history of a nation's literature: first, the *race* to which the nation belongs; second, its *position* both geographical and in civilization in the different phases of its literary development; and third, the *period* or duration of these. Under this view, the history of literature assumes the character of a psychological problem. Among Taine's recent works is *Les Origines de la France Contemporaine*, of which the first installment, *L'Ancien Régime*, appeared in 1875 (Eng. transl., 1876). In this the writer gives a graphic account of the social disease that led to the French revolution. A picture of the revolutionary age itself followed in *La Révolution* (vol. i. 1878). He subsequently published *La Conquête Jacobine* (1881); *Le Gouvernement Révolutionnaire* (1885); *Le Régime Moderne* (1891); *Journeys through France* (Eng. translation, 1897). T. was elected a member of the academy in 1878, and died March 5, 1893.

TAIRA, or **HEI**, the name of a celebrated family of Japanese nobles, who with their rivals, the Minamots, kept the empire in turmoil during two centuries. Like the wars of the Roses in England, the war of the red and white banners in Japan ended only when one family was almost annihilated. The Taira house was founded by Takamochi, a great-grandson of the mikado Kuammu who reigned, 782-805. His descendants were for two centuries the military vassals of the emperor. Kiyomori, who became premier, 1167, was virtually ruler of Japan, his daughter being empress, his grandson mikado, and 60 of his relatives holding the highest offices at court, and their lands covering thirty provinces. At the height of their power, the long feud with their rivals, the Minamots, broke out in implacable enmity, 1156. In 1184, after suffering the loss of several bloody battles, driven from Kioto, and from castle to castle, they were slain or imprisoned to the last man, except a few exiles, as the result of the great naval battle of Shimonoséki, and the young mikado Antoku was drowned. In 1870, after 700 years of seclusion, the remnant of the Taira exiles were discovered in a remote mountainous district in Higo, island of Kiushiu.

TAIT, **ARCHIBALD CAMPBELL**, D.D., LL.D.; b. Edinburgh, 1811; educated at the university of Edinburgh and Oxford, becoming afterward a public examiner of the latter; succeeded Dr. Arnold as head-master of Rugby, 1842-50; was made dean of Carlisle, 1850; bishop of London, 1856; archbishop of Canterbury, 1868. He was known as a

prominent opponent of the Tractarians. Among his published works are *The Dangers and Safeguards of Modern Theology*; *The Word of God and the Ground of Faith*; and a volume of sermons. He d. 1882.

TAIT, PETER GUTHRIE, b. England, 1825; graduate of Cambridge, fellow of St. Peter's college; prof. of mathematics in Queen's college, Belfast; prof. of natural philosophy in the university of Edinburgh, 1860. Associated with W. J. Steele, he published *A Treatise on Dynamics of a Particle* (1856); *Elementary Treatise on Natural Philosophy*, with sir Wm. Thomson, fellow of St. Peter's college (1867). He has been associated with Prof. Balfour Stewart in some publications. He published *Thermodynamics* (1868); *Properties of Matter* (1885); *Dynamics* (1895); and other works.

TAI-WAN-FOO, a large city on the s.w. coast of the island of Formosa, with a population (1891) of 135,000, since 1886 known under the name of Tainan. Down to 1885 it was the capital of the island. It is a large straggling town, containing park-like spaces and fine trees, and is surrounded by a high battlemented wall. Canals from the sea run through the level plain that surrounds it, affording means of transportation from the coast. While it was the capital of the Chinese district of Formosa, it was the seat of many important civil and military officials. By the treaty of Shimonoseki in 1895, Formosa was ceded to Japan, but T. still remains the chief city on the island. It is a treaty port and its foreign commerce is extensive, including imports of opium, cottons, woollens, metals, medicines, kerosene oil, rice, flour, etc., and exports of sugar, hemp, camphor, etc. On the coast near by is the port of Takao, which contains a custom house. Tai-Wan, or Tainan, is the seat of Roman Catholic and Evangelical missions, and has telegraph connections with other ports.

TALAVEIRA DE LA REYNA, a t. of Spain, in New Castile, in the modern province of Toledo, is charmingly situated on the Tagus, 75 m. s.w. of Madrid. It is ancient, straggling, dirty, and inconvenient, is surrounded by interesting old walls, and abounds in antique picturesque fragments. It was formerly a flourishing town; but of its manufactures, only those of silk and earthenware are now carried on. Fruits are extensively produced in the vicinity. Here, on July 27 and 28, 1809, sir Arthur Wellesley, with 19,000 English and German troops, and about 34,000 Spaniards, who, however, with very trifling exceptions, were not engaged, defeated upward of 50,000 veteran French troops, under Joseph Bonaparte and marshals Jourdan and Victor. Pop. '87, 10,490.

TALBOT, perhaps originally a name equivalent to blood-hound (q. v.), but afterward applied to a race of hounds, now extinct, or nearly so, which seem to have been kept for show rather than for use. The talbot was of pure white color, with large head, very broad muzzle, long pendulous ears, and rough-hair on the belly. The white St. Hubert dog was either the talbot or a nearly allied breed. The talbot is the badge of the ancient house of Shrewsbury (surname Talbot), and the crest of some of the princely houses of Germany.

TALBOT, a co. in w. Georgia, having the Flint river for its n.e. boundary; drained by Upatoi creek; 360 sq. m.; pop. '90, 13,258, chiefly of American birth, includ. colored. It is intersected by the Talbotton railroad. The surface is hilly, with a large proportion woodland. The soil produces grain and sweet potatoes, and is susceptible of much higher cultivation. Live stock is raised. It has grist mills and cotton gin works. Co. seat, Talbotton.

TALBOT, a co. in e. Maryland, having the Chesapeake bay on the w., the Choptank river on the s. and s.e.; drained also by Tuckahoe creek; 285 sq. m.; pop. '90, 19,736, chiefly of American birth, includ. colored. It is intersected by the Philadelphia, Wilmington, and Baltimore, and other railroads. Co. seat, Easton.

TALBOT, ETHELBERT, the Rt. Rev., was born at Fayette, Mo., in 1848; graduated from Dartmouth college in 1870, and from the Episcopal general theological seminary in New York city in 1873. He became rector of St. James parish at Macon, Mo. In 1887 he was consecrated missionary bishop of Wyoming and Idaho, and in 1891 bishop of Georgia.

TALBOT, JAMES, LL.D., Baron Talbot de Malahide, b. Ireland, 1805; educated at Trinity college, Cambridge; member of parliament for Athlone in the liberal interest, 1832, defeated in 1835. He succeeded to his father's title in 1850; was created peer of the United Kingdom, 1856. He was president of the archæological society of Great Britain and Ireland. He occupied a similar position in relation to the geological and zoological societies of Dublin; and resigned the office of president of the council of the Royal Irish academy, 1869. He is the author of a monograph of the house of Talbot, including the senior branch, the head of which is the earl of Shrewsbury. He d. 1883.

TALBOT, JOHN (1645-1727), was rector of Freetherne, England; chaplain of the *Centurion*, in which the missionaries of the Gospel propagation society came to America, 1702; founder and first rector of St. Mary's church, Burlington, N. J., 1703; for many years a leader of the church of England in the American colonies; consecrated bishop by non-jurors in England, 1722.

TALBOT, JOSEPH CRUIKSHANK, D.D., 1816-83; b. Alexandria, Va.; d. Indianapolis. He was brought up a Quaker, but became an Episcopalian, 1837, and was ordained a minister, 1848. He had a charge at Louisville, Ky., 1848-55, and then at Indianapolis. He became miss. bp. of the northwest, 1860, asst. bp. of Ind., 1865, and bp., 1872.

TALBOT, MATTHEW, b. England in the middle of the 18th century. He published *An Analysis of the Holy Bible, containing the whole of the Old and New Testaments*

collected and arranged systematically in 30 Books, which are subdivided into 285 Chapters and 4,144 Sections. This was republished in the United States by the rev. Dr. Nathaniel West, which was revised under the title of *The New and Complete Analysis of the Holy Bible* by the Rev. Dr. R. D. Hitchcock.

TALBOT, SILAS, 1751-1813; b. Mass.; present at the siege of Boston during the revolutionary war as capt. in a regt. from his state; brev.maj. by congress, 1776, for skillful work in New York harbor against the British fleet. He was wounded at Fort Mifflin, 1777, but remained on the field till the fight was over. In the following year he assisted Gen. Sullivan by transporting the American forces from the main-land to Rhode Island, brevet lieut.col. for the brilliant exploit of capturing the British floating battery *Pigot*, 23 guns, anchored in one of the channels threatening Newport. In 1779 on a cruise off the New England coast, with his prize and the sloop *Argo*, 10 guns, he captured *The Lively*, 12 guns, and 2 letters-of-marque, *The King George*, and *The Dragon*; was made brevet capt. in the navy, 1779, for taking *The Dragon* after a four hours' battle. He was taken in 1780 by the British and imprisoned in the Jersey prison; exchanged the following year. At the close of the war he bought the confiscated property of sir William Johnson near the Mohawk river; was representative to the assembly for several years; member of congress, 1793-94. The frigate *Constitution* (Old Ironsides) was built under his supervision, and in 1799 was his flag-ship during a cruise in the West Indies. He resigned 1801, and passed the rest of his life in New York.

TALBOT, WILLIAM HENRY FOX, celebrated in connection with photography, was the son of William D. Talbot of Locock Abbey, Wilts, and was b. in 1800. He was educated at Harrow, and afterward at Trinity college, Cambridge, where he took his degree with honors, and obtained the junior chancellor's medal in 1821. In the first parliament summoned after the passing of the reform bill, Talbot sat for Chippenham; but scientific investigation being more to his taste, he gave up politics, and devoted himself to the problem of fixing shadows, ignorant at the time of what had been effected in this department by Wedgwood and Davy. Step by step he discovered for himself a method of obtaining and fixing sun-pictures, and on the dissemination of a report as to Daguerre's successes in the same field, secured his just rights by publishing a paper (*Phil. Mag.*, Mar., 1839), in which the successive steps of his investigation and their result were detailed. See PHOTOGRAPHY. This process, by which a *negative* (q.v.) was primarily obtained, was subsequently improved by his invention (patent dated Feb. 8, 1841) of the calotype (q.v.) process. Soon afterward he obtained fresh patents, for an "instantaneous process" (which seems to have well deserved the name, as by it a legible picture was obtained of a printed bill fastened to the rim of a wheel revolving 200 times per second), a mode of "photographic engraving," and a "polyglyptic process." A later invention of his, patented in 1858, was called by him photoglyphic engraving; see PHOTOGRAPHY. In 1842 Talbot obtained the medal of the royal society for his previous discoveries. Latterly he devoted himself to the study of general physics, and to philological and miscellaneous researches. He died Sept. 17, 1877. Among his works are *Hermes, or Classical and Antiquarian Researches*; *Legendary Tales*; *Illustrations of the Antiquity of the Book of Genesis*; and a work on *English Etymologies*.

TALBOTYPE, a photographic process, called by the inventor, Mr. Fox Talbot, the calotype process (q.v.). Its essential features consist in the production in the camera of an image by light on the surface of chemically prepared paper, and this distinguishes it from other paper processes, and by consequence from other photographic processes.

TALC, a mineral allied to mica (q.v.), and, like it, easily separated into very thin flakes, which are transparent and flexible, but not elastic, like those of mica. Talc is composed almost entirely of silica and magnesia, in the proportions of 57-63 silica, and 30-35 magnesia, with 2-6 water. Its colors are silvery white, greenish white, and green. It has a pearly or semi-metallic luster, and is unctuous to the touch, in which it differs from mica. It occurs crystallized, generally in hexagonal tables, or in long prisms: the primary form is a rhomboid. It is also found massive, in beds chiefly in micaceous schists, gneiss, and serpentine.—A kind called *indurated talc*, or *talc slate*, has a curved slaty structure, and is not separable into laminæ, like common talc. It approaches in character to steatite, and is used for similar purposes.

TALCA, a t. in Chile, in the province of Talca, of which it is the capital; pop. 1883, 23,432. It is on the Maule river, about 45 m. n. of Chillan; contains a seminary for priests, and other educational institutions, and has a growing trade.

TALCOTT, ANDREW, b. Conn., in 1797; graduate of West Point, 1818. In 1819 he accompanied gen. Atkinson on an expedition to the upper Missouri and Yellowstone rivers to establish military posts; returned to the e. and in 1821-35 engaged in building defenses at Hampton Roads, Fort Delaware, and other exposed situations. In 1832-36 he was engaged on the boundary line between Ohio and Michigan, and the improvements on the Hudson river; resigned 1836 and became division engineer on the Erie railroad. He was on many important commissions for constructing dry-docks and defenses, and was chief engineer of several railroads. He d. 1883.

TALCOTT, JOHN, about 1630-88; born England; brought to Hartford, Conn., by his father, who became one of the governor's "assistants." The son held the office of treas-

urer of the colony, and is best known as the leader of the expedition which saved Hadley from the attack of 700 Indians, and for his courage in other Indian warfare.

TALEGAL'LA, a genus of gallinaceous birds, of the family *megapodidae*, having a strong, thick, and very short bill, the upper mandible curved and pointed; the head and neck almost quite naked; the wings short and round; the tail rather long, rounded on the sides; the legs strong, feathered a little below the joint of the tibia and tarsus; the tarsi covered with scales in front; the toes long and strong; the claws large and sharp. The species are natives of Australia and New Guinea. The best known is the **BRUSH TURKEY** (*T. lathamii*) of Australia, also known as the **WATTLED TALEGALLA** and the **NEW HOLLAND VULTURE**, the latter name being given to it on account of its naked head and neck, covered in part with fleshy wattles. It is pretty common in New South Wales, inhabiting the most thickly wooded parts. It is a large bird, about the size of a turkey, with blackish-brown plumage. It is shy, and when pursued, endeavors to escape by running through the thickest *brush*, or by leaping to the lowest branches of a tree, from which it ascends higher and higher, branch by branch. It thus avoids the dingoes or native dogs, which, however, often hunt it down on open ground. It is easy game to the sportsman, who finds it roosting under shelter of the branches of trees during the heat of the day, and although several of a flock are shot, the rest keep their place undisturbed. The talegalla is generally seen in small flocks, and they make their nests together, the males heaping up, by means of their feet, mounds of several cartloads of earth and decayed leaves, which are used from year to year, new materials being added every year. The eggs are hatched by the heat of the sun and of the fermenting mound, each egg being separately buried. The parent birds partially uncover them during the day. Nearly a bushel of eggs may sometimes be found in a single heap. The male bird pays great attention to the young after they are hatched, covering them up partially in the mound at night for warmth. The flesh of the talegalla is excellent, and the eggs are also very delicate and eagerly sought after. It is thought that this bird might easily be added to the list of our domestic poultry.

TALENT (Gr. *talanton*, from a root to balance or weigh), a word used by Homer to signify indifferently a balance, and a definite weight of some monetary currency. But the weight of money to which Homer applies the term talent was very different from that to which it was applied in later times. Tradition assigns to Pheidon, king of Argos, the introduction of the talent as a standard of money and weight. The *exact* identity of the Æginetan talent with that known as the Babylonian, and generally employed in the east, points to its true origin. It was in all probability introduced into Greece by the Phenicians, who also introduced a smaller monetary measure and weight, which was by the Greeks known as the Euboic talent. The names Æginetan and Euboic indicate that the talents to which these epithets apply were first used in Ægina and Eubœa; and though, in the east, the larger talent was used for silver, and the smaller for gold, after their introduction into Greece all such distinctive application was soon done away with. The use of the Euboic talent was mostly confined to Athens, Chalcis, and the Chalcidian colonies; while the Æginetan prevailed over the rest of the Greek world. In the 6th c. B.C., Solon introduced at Athens a new talent, which, as the *Attic talent*, succeeded, partly through its superior purity, and partly on account of the greater commercial activity of Athens, in supplanting the other two standards. These several talents were similarly subdivided into 60 minæ, the mina into 100 drachmæ, and the drachma into 6 oboli; and their relative proportions are Æginetan talent: Euboic talent: Attic talent:: 30: 25: 18, both with respect to their values as weights, and as measures of monetary amount. The following are the values as compared with American standards:

| | | AS WEIGHT. | | | | AS MONEY (SILVER). | |
|-----------------|---|-------------------|---|--|--|--------------------|--|
| | | lbs. avoirdupois. | | | | | |
| Æginetan talent | = | 95 | = | | | \$2,030 | |
| Euboic " | = | 79.16 | = | | | 1,692.50 | |
| Attic " | = | 57. | = | | | 1,118.75 | |

But by the same decree of Solon, a new commercial talent, of increased weight, was introduced, but only as a weight for goods, not for money.

TALFOURD, Sir THOMAS NOON, D.C.L., 1795-1854; b. England; studied law; was a member of parliament from 1835-41, and 1847-49, when he received an appointment as judge of the court of common pleas. He advocated in parliament the rights of authors, and introduced in 1837 the copyright act, which with a few alterations was passed in 1842. He wrote the tragedy of *Ion* in 1835, which was performed with great success, and subsequently *The Athenian Captive* (1838); *Glencoe* (1840); and *The Castilian* (1854). He also published *Memoirs and Correspondence of Charles Lamb* (1837); *Final Memorials of Charles Lamb* (1848), and *Vacation Rambles* (1844).

TALATAFERRO, a co. in n.e. Georgia; drained by the Ogeechee and Little rivers; traversed by the Georgia railroad; area, 168 sq. m.; pop. '90, 7291, includ. colored. The surface is irregular. The soil is fairly fertile. The principal productions are corn, cotton, and live stock. Co. seat, Crawfordville.

TALIAFERRO, BENJAMIN, about 1750-1821; b. Va.; a member of Morgan's rifle corps; served at Saratoga, Monmouth, and Savannah, greatly distinguishing himself for coolness and daring on the field. He was aid-de-camp to Gen. Lincoln at Charleston in 1780, and was taken prisoner. In 1784 he removed to Georgia; delegate to the Georgia state constitutional convention, 1798; member of congress, 1799-1802, and filled the office of judge of the superior court, state senator, and president of the state senate.

TALIESIN, a Welsh bard, said to be the son of Hweng, and supposed to have lived in the 6th century. He was called the "chief of the bards," and was, with the two Merlins, the most celebrated among the Christian bards. The *Archæology of Wales* contains some pieces said to be his.

TALIPAT PALM, or Great Fan Palm, *Corypha umbraculifera*, the noblest palm of the East Indies, a native of Ceylon, Malabar, etc. It grows to the height of 60, 70, or even 100 ft., and has a straight cylindrical trunk, crowned with a tuft of enormous palmate plaited leaves, which are divided near the outer margin into numerous segments, and are united to the trunk by spiny leaf-stalks. The leaves are usually about 18 ft. long, exclusive of the leaf-stalk, and 14 ft. broad; a single one being sufficient to protect 15 or 20 men from rain. At the age of 30 or 40 years the tree flowers, and, after ripening fruit, generally dies. It produces a long conical erect spadix, rising to the height of 30 ft. from the midst of its crown of leaves, and dividing into simple alternate branches, the lower of which sometimes extend laterally 20 ft., the whole covered with whitish flowers, and forming a very beautiful and magnificent object. The fruit is very abundant, globose, and about an inch and a half in diameter. The leaves are used for covering houses, for making tents, and for many other purposes. On occasions of ceremony every Singhalese noble is followed by an attendant, who carries above his head a richly ornamented talipat palm leaf, which is capable of being folded up like a fan, and is then not thicker than a man's arm, and wonderfully light. The leaves of this palm are used in Malabar for writing upon, characters being traced upon them with an iron style. They are prepared for this purpose by boiling, drying, damping, rubbing, and pressing. The soft central part of the stem, pounded and made into bread, has often been of great use in times of scarcity. See illus. PALMS, vol. XI., fig. 7.

TALIPES, the scientific name for CLUB-FOOT (q.v.). It is derived from the Latin words *talus*, the heel, and *pes*, the foot.

TALISMAN (Arabic, but supposed to be derived from the Gr. *telesma*, in the sense of celebration of religious ceremonies), a species of charm, consisting of a figure engraved on metal or stone when two planets are in conjunction, or when a star is at its culminating point, and supposed to exert some protective influence over the wearer of it. The terms talisman and amulet (q.v.) are often considered nearly synonymous, but the proper distinctive peculiarity of the former is its astrological character. Talismanic virtues have often been attributed to a peculiarly marked or formed egg, and instances are recorded, by various authors, of eggs hatched with figures of comets or eclipses on them. A species of talisman, which has acquired considerable celebrity is the Abraxas stone (q.v.). A species of talisman at present in use in Asia, is a piece of paper on which the names of the seven sleepers and their dog are inscribed. Pasted on the walls of houses, it is believed to be a protection against ghosts and demons.

TALLADEGA, a co. in n.e. central Alabama; drained by the Coosa river and Choccolocco creek; traversed by the Central of Georgia, the Birmingham and Atlantic, the Louisville and Nashville, and the Southern railroads; area, 784 sq. m.; pop. '90, 29,346, includ. colored. The surface is somewhat hilly, and much of it woodland. The soil is fertile. The principal productions are corn, cotton, wheat, and cattle. Co. seat, Talladega.

TALLADEGA, city and co. seat of Talladega co., Ala.; on the Birmingham and Atlantic, the Louisville and Nashville, and the Southern railroads; 41 miles e. of Birmingham. It is the seat of the State institute for the deaf, the State school for negro deaf-mutes and blind, the State academy for the blind, Talladega college for colored students (Cong.), Isabel female college, and the Presbyterian State orphans' home. The city covers a part of the field on which Gen. Jackson defeated a large force of Creek Indians in 1813. There are gas lights, national banks, waterworks, railroad construction and repair shops, cotton-mill, tannery, iron furnaces, cotton gins, and weekly newspapers. Pop. '90, 2063.

TALLAGE (said by Lord Coke to be from Fr. *tailler*, to share or cut out a part), a name which has been sometimes applied generally to subsidies or taxes of every kind, but which, in its more proper and restricted sense, denotes those taxes to which, under the Anglo-Norman kings, the demesne lands of the crown and all royal towns were subject, which were far more rigorous and irregular than the taxes imposed on the gentry.

TALLAHASSEE, city, capital of Florida, and co. seat of Leon co.; on the Florida Central and Peninsular and the Carrabelle, Tallahassee, and Georgia railroads; 20 miles n. of Appalachee bay, gulf of Mexico. It contains a U. S. government building, the State seminary, the State normal, agricultural, and industrial institute for colored pupils, university and supreme court libraries, several public parks with fountains, gas, street railroad, and artesian water plants, national and state banks, railroad construction and

repair shops, and ice, cigar, and cotton factories. The city is in a farming and fruit-growing region, and has separate churches and schools for whites and negroes, and weekly newspapers. Pop. '90, 2934.

TALLAHATCHEE, a co. in n.w. Mississippi, drained by the Tallahatchee river and several creeks; traversed by the Illinois Central railroad; 635 sq. m.; pop. '90, 14,361, chiefly of American birth, includ. colored. The surface is level and in part swampy; cotton, corn, pork, and cattle are the staples. Co. seat, Charleston.

TALLAPOOSA, a co. in e. Alabama; drained by the Tallapoosa river and Sandy creek; traversed by the Central of Georgia railroad; 795 sq. m.; pop. '90, 25,460, chiefly of American birth, includ. colored. The surface is rough and heavily wooded; cotton, corn, cattle, wheat, and pork are staples. Co. seat, Dadeville.

TALLAPOOSA, a city in Haralson co., Ga.; on the Southern railroad, near the Tallapoosa river; 63 miles w. of Atlanta. It contains a high school, public library, Lithia Springs park, electric light and water plants, hotels, furniture factory, machine works, saw and planing mill, state banks, and several churches. It is in a rich iron, timber, and farming region, and has large interests in iron mining. Pop. '90, 1699.

TALLEYRAND-PERIGORD, CHARLES MAURICE, duc de Prince of Benevento, the most subtle, shrewd, and unprincipled of all modern diplomatists, was b. at Paris, Feb. 13, 1754, of an ancient and distinguished family. His father, CHARLES DANIEL, COMTE DE TALLEYRAND-PERIGORD (b. 1734, d. 1788), was an officer in the French army, and fought all through the seven years' war. CHARLES MAURICE being the eldest son, would in all probability have been designed for a military career had not an accident which he met with when only a year old, rendered him lame for the rest of his life. He was, in consequence, trained for the church, and studied at St. Sulpice, the Sorbonne, and Rheims, but at no period did he betray the least inclination toward a Christian or even a moral life. At the age of 20 he came to Paris and rapidly acquired a reputation for licentiousness. This, however, did not prevent him from obtaining several ecclesiastical benefices, among others the abbacy of St. Denis, in the diocese of Rheims (1775). Appointed *agent général* for the clergy in 1780, a lucrative and important post, which brought him into close connection with the heads of the administrative in France, he now began a serious apprenticeship to public business, without, however, pausing in his career of gallantry. So notorious was his *infâme conduite* (as Mirabeau calls it), that for some years Louis XVI. shrank from conferring on him further ecclesiastical preferment, and it was only on account of his administrative abilities that in 1788 he obtained the bishopric of Autun. When the convocation of the *états-généraux* took place in the year following, he was elected by the clergy of his diocese to represent it, and pronounced in favor of an amalgamation with the *tiers état*, which on June 17 had constituted itself the *assemblée nationale*. His attitude and speeches recommended him to the notice of the popular party, and along with Mounier, Sieyès, and Lally-Tolendal, he was appointed to draw up a constitution for the nation. In this capacity he took an active part in framing the famous declaration of rights, and he was one of those selected (after the destruction of the Bastille) to investigate the causes and peculiar features of the revolutionary movement. It was Talleyrand who proposed (Oct. 10, 1789) the startling measure for the confiscation of church property, arguing that such property did not really belong to the church, but to the nation, and that if the rights of the existing clergy were secured, the nation or its representatives were at liberty to apply it to any purpose they saw fit. On Feb. 13, 1790, a decree for the suppression of religious orders was carried in spite of a vehement opposition, and three days after Talleyrand became president of the assembly. He was one of the first among his order to take the oath to obey the constitution (Dec. 28, 1790), and eagerly urged the clergy of his diocese to follow his example. About the same time he demitted his bishopric of Autun, yet in the following February we read of his consecrating two new bishops (those of Aisne and Finisterre), and although denounced in pontifical briefs as a schismatic, declaring his sincere attachment to the holy see!

Our space does not permit us to describe the important share that Talleyrand had in the financial deliberations of this first period of the revolution, but we must specially note the sagacity he displayed in pointing out the perils attending the issue of assignats, his skill in preparing the way for the adoption of the principle of uniformity in weights and measures, and of an arc of a meridian as the basis of the new metrical system; and, above all, the luminous intelligence shown in the report which he gave in to the assembly (Sept. 10 and 11, 1791) upon public instruction—a report conceived in the liberal and comprehensive spirit of the times, and which was undoubtedly the model followed in all the great changes that subsequently took place when France reorganized her educational system.

In 1792, when the old European despotisms were obviously preparing to coerce the young republic, Talleyrand was sent to London—but not in an official character—to negotiate with the English government. He did not make a favorable impression on George III. or on Pitt. Thrice in that year he essayed to procure a recognition of the republican government, but in vain. The "September massacres" (see SEPTEMBERISTS) made even the staunchest admirers of the revolution shudder. Nothing, therefore, could be done; and Talleyrand would doubtless have returned to France had not a letter of M. de Laporte *intendant* of the civil list of Louis XVI., been discovered, in which Tal-

Talleyrand was noted as a man "disposed to serve" the king. He was immediately placed on the list of *émigrés*, i.e., proscribed (Dec., 1792); and thus his connection with the revolution—fortunately, we believe, for his reputation—was suddenly brought to a close. His career as an exile was (as is generally the case) one of hardship and insignificance. He remained in England till forced to leave by the "alien bill," when he sailed for the United States (Feb., 1794), where he lived for more than a year. After the fall of the terrorists he procured the revocation of his banishment, and in March, 1796, re-entered Paris, having paved the way for a favorable reception by a series of the most adroit and judicious intrigues. We may first note, *en passant*, that in private life he continued to play the rôle of a gay Lothario.

Talleyrand attached himself to the *cercle constitutionnel* that gathered round Mme. de Staël, and so dexterously did he comport himself, that in 1797 he was named minister of foreign affairs in place of C. Delacroix. The rise of Bonaparte was a phenomenon which so penetrating a politician as Talleyrand could not overlook. He cultivated the friendship of the young gen. with a sagacious assiduity, keeping him constantly *au courant*, when away from Paris, of the situation of parties, and became his confidant in those designs, the execution of which resulted in the overthrow of the directory, Brumaire 18 (q.v.), 1799. After this *coup d'état* the subtle finesse of Talleyrand was constantly in requisition. He divined, with a sort of miraculous cleverness, the ideas of Bonaparte, and his whole policy was directed to consolidate the power and authority of his master. In all the diplomatic negotiations that followed the victories of France under the consulate he had the principal part; but Bonaparte thoroughly understood his man, and Talleyrand was quite conscious, as M. Thiers remarks, that he could never impose on his superior. It was he who proposed the kidnapping of the duke d'Enghien (q.v.); and it was by his instructions that the crime was consummated, in spite of the vehement opposition of Josephine, whose honest indignation led her to denounce him as a *maudit boiteux* (cursed cripple). Talleyrand took an active part in preparing the way for the establishment of the empire (1804); and when in the following year England, dreading a French invasion, formed a powerful European coalition against France, it was by the ingenuity of Talleyrand that it was partly broken up. To him, as much as to Napoleon, was owing the organization (1806) of the famous *confederation of the Rhine* (q.v.), which so effectually served the ambitious designs of the emperor. In conducting the negotiations that brought about this confederation he exhibited a truly Machiavellian art. Napoleon was not ungrateful. Talleyrand received the principality of Benevento, which he held as an imperial fief.

When the views of the emperor in regard to Spain became apparent, Talleyrand, who for more than a year had rather fallen into disfavor with Napoleon, came forward with a plan of his own, which, however, was not adopted; but his presence at the interview between Alexander and Napoleon at Erfurt (1808) proved that his influence was as yet undiminished. The ill success of the Spanish war (at first) induced Talleyrand to pronounce against it, and occasioned violent invectives on the side of his sovereign, to which the accomplished cynic (who retained to the last the manners of the old noblesse) only replied by the sarcasm: "*Quel dommage qu'un si grand homme soit si mal élevé!*" (What a misfortune that so great a man should have been so badly educated!). Talleyrand declared in favor of the Austrian marriage; but already the *entente cordiale* between him and Napoleon was ruptured, and he began to look forward to a future in which his own schemes might be hostile to those of the emperor. In a word he was meditating treachery against the power by which he had risen. The victories of Wellington in Spain, and the reverses of Napoleon in Russia and Germany, widened the breach between them, and Talleyrand now only waited the decisive moment in which to ruin the cause of his master. He became the center of a group of Parisian malcontents, whose influence grew with the advance of the allied armies, and finally communications were opened up with the latter and with the Bourbons. It was Talleyrand who dictated to the senate the terms of the deposition of Napoleon; and on the restoration of the Bourbons he became minister of foreign affairs in the first government of Louis XVIII. He was also head of the French legation in the celebrated congress of Vienna; but after the battle of Waterloo a coldness sprang up between him and the Bourbons, and he was relieved of all his offices. Henceforth his career is uninteresting to the student of history. He caballed to regain power, but in vain; and during the reigns of Louis XVIII. and Charles X. he was merely a discontented senator, who never lost an opportunity of injuring the court and the government. After the July Revolution, Louis Philippe employed him as ambassador at the English court, where he contrived to bring about a friendly feeling between the new monarchy and the English government. During the brief remainder of his life nothing externally notable occurred. He died at Valençay, May 17, 1838. Talleyrand was neither a wise, nor a great, nor a good man; but he was infinitely cunning, dexterous, and supple. He had a larger share than most men of what Carlyle calls "vulpine understanding;" and if this world had had nothing but knaves and fools in it, the policy and principles of Talleyrand might have enjoyed a perpetual triumph; but there were forces in the world, both intellectual and moral, of which he took no account, but which took account of him, and, with all his amazing cleverness, dropped him into obscurity and disgrace. Talleyrand was an 18th c. skeptic, over whom the revolution had exercised little influence, while France, and indeed all Europe, had been roused into earnestness by the outburst; and when the ideas of political liberty began their swift, irresistible march,

this *diable boiteux* inevitably lagged behind, and sank out of sight. Talleyrand has left *Mémoires*, which were first published in Dec., 1890. For estimates of his character and policy, see the *Mémoires Politiques* of Lamartine; the *Histoire de Dix Ans* of Louis Blanc, where Talleyrand is rigorously criticised; the *Mémoires* of Guizot, where he is handled with equal severity and justice *Notices et Portraits*, by Mignet; and *Vie Religieuse et Politique de Talleyrand* (Par. 1838), by L. Bastide.

TALLICOO NAH OIL. See CARAPA.

TALLIEN, JEAN LAMBERT, a French revolutionist, was born at Paris in 1769, and first became notable in the beginning of 1792 as the editor of a Jacobin journal, called *L'Ami des Citoyens*, meant to be a friendly rival of Marat's *Ami du Peuple*. From this date his influence over the lower orders of the city steadily increased. He was conspicuous in the events of August 10, and in consequence received the appointment of secretary to the *Commune Insurrectionnelle*. He promoted and afterward defended the massacres of September; and on account of his unscrupulous zeal, was elected to the convention by the department of Seine-et-Oise. There he became the apologist if not the advocate of Marat, denounced the minister Roland, urged with savage emphasis the condemnation of Louis XVI., and was rabidly eager for the ostracism and annihilation of the Girondists (q.v.). Toward the close of 1793 he was sent to Bordeaux, charged with the mission of destroying every trace of the party he hated. His career in the south-west was a mixture of reckless cruelty and shameful vice. To the odious tyrannies of a proconsul he added the luxurious profligacy of a satrap. Fortunately for his countrymen, a passion which he conceived for one of his victims, Madame de Fontenay (*née* Cabarrus), led him to pause in his bloody course. He was called to Paris to account for this singular change in his disposition, satisfied his associates (by paroxysms of patriotic vehemence) that it meant nothing particular, and on March 22, 1794, was chosen president of the convention. Robespierre, however, had found out the sort of man that Tallien was. He hated him for his insincerity and immorality, felt instinctively that he could not be trusted, denounced him severely in the convention, and on June 14 got his name erased from the list of members at the Jacobins. Tallien recognized his danger, and taking advantage of the reaction against the terrorists (though himself one of the basest of the set), already beginning to show itself in France, he dexterously rallied the Dantonists, Hebertists, and others against the rigorous government of Robespierre, St. Just, and Couthon, and brought about the events of the 9th Thermidor (July 27, 1794), which caused the fall of the triumvirate. Tallien now became for a short time one of the most notable and influential men in France; lent his aid to suppress the revolutionary tribunal and the Jacobin club, and drew up the accusations against Carrier, Le Bon, and others of the terrorists! But France could not long tolerate this affectation of virtue on the part of one so infamous; his past life was perpetually held up to scorn and reproach; and finally, on May 20, 1798, he was forced to leave the council of five hundred. Henceforth his career is pitifully insignificant. He accompanied Bonaparte to Egypt as *savant* (?), quarreled with Gen. Menou, and on his return to France, was captured by an English cruiser, and brought to England, where the whig opposition was stupid enough to make a hero of him (1801). Soon after he returned to France, and was contemptuously dismissed as consul to Alicante by Talleyrand, outlived (in utter obscurity) the empire of Napoleon, and died at Paris, Nov. 16, 1820, supported in his last days by the heirs of the monarch for whose death he had inhumanly clamored. His wife (1775-1835) was the daughter of the Spanish minister, Count Cabarrus, and was previously married to the Marquis de Fontenay, with whom she fled from Paris in order to avoid the terrors of the revolution. It was at this time that she was seized by the authorities at Bordeaux, and that Tallien, falling in love with her, procured her release. She was afterward divorced from the marquis and became Tallien's wife after the overthrow of Robespierre. Under the Directory her salon was one of the most brilliant in Paris. While Tallien was absent in Egypt, she was in turn divorced from him and married, in 1805, Count de Caraman, afterwards Prince de Chimay.

TALLMADGE, BENJAMIN, 1754-1835; b. N. Y.; graduated Yale college, 1773; principal of a high school at Wethersfield, Conn.; entered the continental army; became lieut., adjt., and col. of a Connecticut regiment, 1776; surprised and captured 500 tory marauders at Lloyds' Neck, L. I., Sept. 5, 1779, without losing one of his men; planned and led the expedition which took fort George, Oyster bay, and destroyed the British stores on Long Island, 1780; was in some of the principal battles of the war, had charge of Maj. André until the execution of his sentence; was one of Washington's military family, and conducted his secret correspondence; was a successful merchant after the war, and a member of congress, 1801-17. His *Memoirs* were published by his son.

TALLMADGE, FREDERICK AUGUSTUS, 1792-1869; b. Conn.; graduated at Yale college, 1811; studied law at Litchfield, and was there admitted to the bar. He practised with great success in New York, where he held the offices of recorder, superintendent of police, and clerk of the court of appeals. He was a state senator in 1836, and about the same time a judge of the supreme court of errors. At the "Astor place riot" of 1849 he showed great firmness in restoring order.

TALLMADGE, JAMES, LL.D., 1778-1853; b. N. Y.; graduated at Brown university, 1798; practised law, but gave his attention chiefly to agriculture; was for some time private secretary of Governor George Clinton, and in the war of 1812 commanded the troops that defended New York; was a member of congress, 1817-19, and to a bill for the organization of Missouri into a state, he offered an amendment restricting slavery to the region w. of the Mississippi; was a member of legislature, 1824; lieutenant governor, 1826-27. In 1836 he visited Europe, and introduced American machinery into Russia.

TALLOW. See OILS AND FATS.

TALLOW, MINERAL. See MINERAL TALLOW.

TALLOW TREE, the name given in different parts of the world to trees of different kinds which produce a thick oil or vegetable tallow, or a somewhat resinous substance, which, like tallow, is capable of being used for making candles. Tallow tree of Malabar (*vateria indica*) is a very large tree of the natural order *dipterocarpaceæ*. It has leathery leaves of 4 to 10 ft. long, and panicles of white, fragrant flowers, with five petals. The stem is often 16 ft. in circumference. By incisions in the stem, east Indian copal is got; and by boiling its seeds, there is obtained a firm, white, vegetable tallow, which, as it has no unpleasant smell, is particularly suitable for making both candles and soap.—The tallow tree of China (*stillingia sebifera*) belongs to the natural order *euphorbiaceæ*. The capsules are internally divided into three cells, each containing a nearly hemispherical seed, which is covered with a beautifully white vegetable tallow. This the Chinese collect for the manufacture of candles, in order to which, the capsules and seeds are crushed and boiled, and the fat skimmed off while in a melted state. To give it a firmer consistency, wax is added to it, in the proportion of three parts to ten of the vegetable tallow. Linseed oil is also added. The candles made of it are beautifully white. This tree has been introduced into North America, is cultivated about Charleston and Savannah, and is almost naturalized in the maritime parts of Carolina. It presents a very beautiful and remarkable appearance at the approach of winter, when the leaves become bright red, and the pericarps falling off, leave the white seeds suspended by threads.—The name tallow tree is sometimes given in North America to a species of Candleberry (q.v.).—The tallow tree, or BUTTER AND TALLOW TREE of Sierra Leone, is *pentadesma butyracea*, of the natural order *guttifera*, the fruit of which furnishes a solid oil.

TALLY (Fr. *tallier*, to cut), the name given to the notched sticks which, till a recent period, were used in England for keeping accounts in exchequer, answering the double purpose of receipts and public records. They were well seasoned rods of hazel or willow, inscribed on one side with notches indicating the sum for which the tally was an acknowledgment, and on two opposite sides with the same sum in Roman characters, along with the name of the payer and the date of the transaction. Different kinds of notches, differing in breadth, stood for a penny, a shilling, a pound, £20, £100, and £1000. The tally was cleft through the middle by the deputy-chamberlain with knife and mallet, so that each piece contained one of the written sides, and a half of every notch; and the one-half was retained by the payer as his receipt, while the other was preserved in exchequer. At the union of England and Scotland, a store of hazel rods for tallies was sent to Edinburgh, but never made use of. Act. 23, Geo. III. c. 83 abolished the use of tallies in exchequer, and the old tallies were ordered to be destroyed by 4 and 5 Will. IV. c. 15. The destruction of the houses Parliament by fire in 1834 is supposed to have arisen from the over-heating of the flues in which the discarded tallies were being burned.

TALLY-HO, is an English hunting cry used to urge on the hounds when the fox is viewed; the full cry being *ta-a-ly ho! tally ho!! tally ho; go-ne away, go-ne away*, followed by a peculiar scream that no words could imitate. This cry is thought by some authorities to be a corruption of the French expression *à l'ui, ho! ho! à l'ui*, given by Dame Juliana Berners (q.v.) in her *Book of Hunting* as a hunter's cry of the fifteenth century; but its more probable origin may be traced to the Norman hunting cry, *Tailis an*, "to the coppice," used when the game was making for cover. The term "Tally Ho" was first applied to American coaching (see Coaching), in the year 1876. In amateur coaching in England, it is customary to give each coach a name, as "Defiance," "Wonder," "Tally Ho," "Comet," etc. During the year mentioned, Delancey A. Kane, Esq., of New York City, introduced into this country the first amateur coach, running from New York to Pelham, and called it the "Tally Ho." This coach met with great popularity among New Yorkers and gave an impetus to coaching in all parts of the country; thus the term "Tally Ho" came soon to be the general name for all four-horse coaches of this description in America.

TALLYS, THOMAS, composer, b. about 1510-20; d. in London, Nov. 23, 1585. He achieved great proficiency in organ playing, and was organist at Waltham Abbey for many years. About 1542 he was appointed gentleman of the Chapel Royal and served under Henry VIII., Edward VI., and queens Mary and Elizabeth, and was organist to Elizabeth. In 1575-76, he obtained, with William Byrd, letters patent, giving the exclusive right for twenty-one years of printing music and ruled music paper. The first work printed under this patent was their *Cantiones quæ ab argumento Sacre vocantur quinque et sex partium* (London, 1575), containing 34 motets, by Tallys and Byrd, the work being

a beautiful specimen of typography. About this time he composed his famous song of forty parts, originally written to Latin words, but adapted to English about 1630. Tallys's compositions consist of church music, *Order of Daily Service*; *Full Cathedral Service*; *Order for Morning Prayer with the Litany* *Noted*, all of which have been edited in this century, Te Deums, chants, hymns, motets, responses, etc. His MSS. are in Oxford, Cambridge, and the British Museum. He has been called the father of English cathedral music. See *Grove's Dictionary of Music and Musicians*.

TALMA, FRANÇOIS JOSEPH, an eminent French tragedian, was the son of a dentist, and was b. at Paris, Jan. 15, 1763. He made his *début* as an actor in 1787 at the Comédie Française, where he played the part of Séide in *Mahomet*. He achieved considerable success, but apparently not enough to excite any very high anticipations of his future career, and for upward of a year he figured only in secondary characters. The first thing that induced the public to notice him attentively was an innovation in the matter of costume when playing the part of Proculus in the tragedy of *Brutus*. Previously, actors had worn the garb of their own country, and even their own time; and Roman senators stalked about the stage dressed as Parisian "swells" of the 18th century. The absurdity of this fashion forcibly struck Talma, who set himself to amend it, and in the part referred to appeared in the green-room clothed in a Roman toga, greatly to the astonishment of the company, one of whom (Louise Contat) exclaimed: "Good God! look at Talma; how ridiculous he is! Why, he has quite the air of an ancient statue!" The compliment was as exquisite and as just as it was unintentional. Henceforth, a rigorous accuracy in costume became a point with Talma; but his first grand triumph in acting was won, Nov. 4, 1789, when he played Charles IX. in Chenier's piece of that name. During the revolution he was in the zenith of his popularity, and made peculiarly his own such characters as Abdelazis, in *Abdelazis et Zuléma*; Othello; Néron, in *Epicharis et Néron*; Pharan, in *Abufar*; and Egisthe, in *Agamemnon*. Exceedingly arrogant and choleric, he was often at strife, either with the public or with some of his fellow-actors. Talma was a favorite with Napoleon and Louis XVIII. Some of his later characters were among his best, as Marigny, in *Les Templiers*; Leicester, in *Marie Stuart*; Sylla; Oreste in the *Clytemnestre* of Soumet; Leonidas; and Charles VI. He died Oct. 19, 1826.

TALMAGE, THOMAS DE WITT, D.D., b. N. J., 1832; graduated at New York university, 1853; studied theology at New Brunswick, and in 1856 became pastor of the Reformed church in Belleville, N. J.; in 1859 received a call to the Reformed church in Syracuse, N. Y.; and from 1862 to 1869 was settled in Philadelphia. In the latter year began his connection with the Brooklyn Central Presbyterian church, over which he is still pastor. The original "Tabernacle" was erected in 1870, and destroyed by fire in 1872. In 1874 a new building of brick and stone and of Gothic style, with a seating capacity of 4600, was dedicated. This was destroyed by fire in 1889, but rebuilt. Mr. Talmage has published *The Almond Tree in Blossom* (1870); *Crumbs Swept Up* (1870); *Abominations of Modern Society* (1872); *Sports that Kill*; *Every-day Religion*; *From the Pyramids to the Acropolis* (1892); *From Manger to Throne* (1894), and other writings. He was for several years editor of *The Christian at Work*. In 1879 charges of falsehood and dishonorable business conduct were brought against Dr. Talmage before the Brooklyn presbytery. He was acquitted, and the decision was sustained. In 1894, the Tabernacle was for the third time burned, after which Dr. Talmage resigned the pastorate.

TALMUD (from Heb. *lamad*, to learn)—i.e., study, by way of eminence—is the name of the fundamental code of the Jewish civil and canonical law, comprising the Mishna (q.v.) and the Gemara (q.v.), the former as the text, the latter as the commentary and complement. We have spoken under HALACHA and HAGGADA of the gradual development of this "oral," or, chronologically speaking, post-Mosaic code. We have also there mentioned the older collections upon which the Mishna was framed, and finally redacted in the form in which we now possess it. The oldest codification of Halachoth, or single ordinances, is due to the school of Hillel (q.v.). Simon ben Gamaliel the patriarch (166 A.D.) and his school carefully sifted the material thus brought together; and in the following generation, through Jehudah Hanassi (219 A.D.) and his disciples, the work was brought to its close in six portions (Sedarim), 63 treatises (Mesichtoth), and 524 chapters (Perakim), which contain the single Mishnas. A summary of its contents is given under MISHNA. But besides this authoritatively compiled code, there were a number of other law collections, partly anterior to it, and not fully embodied in it, partly arising out of it—as supplements, complements, by-laws, and the like—partly portions of the ancient Midrash (q.v.); partly either private text-books composed by the masters of the academies for their lectures or enlargements of the existing Mishna. All this additional legal material was collected, not rarely together with the dissensions which begot it, under the name of *Boraitoth*, by Chia and his school, in the succeeding generation. Not to be confounded with them, however, are the collections of *Toseftas* or *Great Mishnas*, which, commenced at the time of Jehudah Hanassi himself, and continued after his death by Chija and Hoshaja, embody much of what has been purposely left out in the concise Mishna; that only embraced the final dicta and decisions. Such "additions" we possess now to 52 treatises, forming together 383 perakim, or chapters. All these different sources of the "oral law"—finally redacted before the end of the 3d c., though probably not committed to writing until 550 A.D.—belong to the period of from about 30 B.C. to about 250 A.D. This great mass of legal matter, although apparently calculated to provide for every case, if not for all times, was yet found insufficient. The

dicta of later masters, the decisions of the courts, the discussions on the meaning and purport of special traditions, the attempts at reconciling apparent contradictions in the received material, the amplifications or modifications of certain injunctions rendered necessary by the shifting wants and conditions of the commonwealth—all these and a number of other circumstances made a further codification peremptory.

We must not omit to state here, that this Mishna (Mathneisin), although it contained nothing but what were indigenous laws and institutions, was yet not a little influenced—if the very fact of its redaction was not indeed caused—by the spirit of the times. At Berytus, at Alexandria, at Rome, the legal schools were then in their most vigorous stage of development, and everywhere system and method were being introduced into what till then had been a vast complex of traditional and popular institutions, decrees, and decisions. The Mishna, in all respects, fulfilled the conditions reasonably to be demanded from such a text-book as it was intended to form; it was clear, concise, complete, and systematic, and moreover, composed in as classical a Hebrew as still could be written in those days of decadence of the “sacred language.”

The further development of this supplementary, oral, or second law, in fact, rather an exegesis thereof, together with the discussions raised by apparent contradictions found in the individual enactments of the Mishnic doctors, is called Gemara Discussion, Complement, or, according to another explanation, Doctrine. Whatever the original meaning of the root (*gamar*), it certainly allows of all these significations. This Gemara contains, apart from the Halacha (q.v.), which is generally written in Aramaic, also a vast number of non-legal, chiefly Hebrew, fragments—homiletic matter, tales, gnomes, legends, and the like—called Haggada (q.v.).

There are two Talmuds, the one called the Talmud of the Occidentals, or the “Jerusalem” (Palestine) Talmud, which was closed at Tiberias, and the other, the “Babylonian” Talmud. The first of these now extends over 39 treatises of the Mishna only, although it once existed to the whole of the first five *Sedarim* or portions. Its final redaction—falsely attributed to R. Jahanan (died 279)—probably belongs to the end of the 4th c. A.D.; but the individual academies and masters through whom it received its completion cannot now be fixed with any degree of certainty. There is less discussion and more precision of expression in this than in the second or Babylonian Talmud, emphatically styled “our Talmud,” which was not completed until the end of the 5th c., and which makes use of the former. As the real editor of the Babylonian Talmud, is to be considered Rabbi Ashe, president of the academy of Syra in Babylon (365–427 A.D.). Both the Mishna and the Palestine Gemara had, notwithstanding the brief period that had elapsed since their redaction, suffered greatly, partly by corruptions that had crept into their (unwritten) text through faulty traditions, partly through the new decisions arrived at independently in the different younger schools—of which there flourished many in different parts of the Dispersion—and which were at times contradictory to those arrived at under different circumstances in former academies. To put an end to these disputes, and the general confusion arising out of them, which threatened to end in sheer chaos, R. Ashe, aided by his disciple and friend Abina, or Rabina (abbr. from Rab Abina), commenced the cyclopean task of collecting anew the enormous mass of Halachistic material which by that time had grown up. The method he pursued was simple enough. His disciples met twice a year at Syra, in spring and in autumn. At the spring gathering, he gave out all the paragraphs of one treatise; and the disciples had the task to find out until the autumn meeting what opinions the different schools had pronounced on the special points thereof. He then investigated the whole critically, and put it into shape according to a certain order. This process took him, with the assistance of ten secretaries, no less than thirty years; and another thirty years were spent by him in the revision of the work, with which he proceeded in the same manner as he had done with the compilation itself. The final close of the work, however, is not due, as generally stated, to R. Jose, his successor at the academy (died 475), but to the school of the Saburaim at the end of the 5th century.

The Babylonian Talmud, as now extant, comprises the Gemara to almost the whole of the 2d, 3d, and 4th *Sedarim* (portions), further to the first treatise of the first, and to the first of the last order. The rest, if it ever existed, seems now lost. The whole work is about four times as large as the Jerusalem one, and is 36 treatises, with the commentaries generally added to them in our editions (Rashi and Tosafoth), fill 2,947 folio leaves. The language of the Talmud is, as we said, Aramaic (western and eastern), or “Chaldee,” closely approaching to Syriac. The minor idiomatic differences between the two are easily accounted for by the different time and place; but the additional matter—quotations and fragments from older Midrash and Gemara collections, Haggada, etc.—is, as before stated, principally written in Hebrew.

The masters of the Mishna (Tanaim) and of the Gemara (Amoraim) were followed by the Saburaim (see above). The code of the oral law had come to a close with the second named; and not its development, but rather its proper study, elucidation, and carrying into practice, was the task of the generations of the learned that followed. Apart from this, the Aramaic language itself began to die out as the popular language, and required a further study. The Saburaim no longer dared to contradict, but only opined on the meaning and practicability of certain enactments, and undertook the task of inculcating and popularizing the teachings laid down by their sires: apart from bestowing proper care upon the purity of the text itself, and adding some indispensable glosses. Their activity was at its height in the 8th c., when Karaism (see JEWISH SECTS), which utterly

denied the authority of the Talmud, sprang into existence. Respecting, however, this authority of the Talmud itself, there has never been anything approaching to a canonicity of the code, or of a reception of it as a binding law-book by the whole nation. The great consideration in which it was always held is owing partly to its intrinsic value, and to the fact of its becoming the basis of all further development of Jewish literature (it being undeniably the most trustworthy receptacle of the traditional Jewish law), and partly to a prosecution against the Jews in the Persian empire at the time of Jesdegerd II., Firuz, and Kobad, who closed the schools and academies for a space of nearly 80 years, during which this book was the sole authoritative guide of public conscience, and remained endowed with its importance even when the schools were restored. The best commentaries of the Mishna are by Maimonides and Bartenora; of the Babylonian Talmud by Rashi (q.v.) and the *Tosajists* of France and Germany. An abstract of the Talmud for practical (legal) purposes by Maimonides (q.v.) is called *Mishne Thorah*. The Mishna was first printed at Naples, 1492; the Talmud of Jerusalem at Venice about 1523. The Babylonian Talmud was first published at Venice in 1520. It is generally printed in twelve folios, the text on the single pages being kept uniform with the previous editions, to facilitate the references. No translation of the Gemara has ever been carried further than a few single treatises. The complete Mishna, on the other hand, has been translated repeatedly into Latin, German, Spanish, etc., by Surenhus, Rabe, Jost, and others. We must refrain, in this place, from attempting a general characterization of the Talmud, a work completely *sui generis*. It will assuredly some day, when properly investigated, prove one of the most important records of humanity. Nothing can give even an approximate idea of the immensity of material, historical, geographical, philological, poetical, that lies hidden in its mounds. A contribution to the records of fanaticism may also be found in the "exoteric" history of the Talmud, which was, albeit utterly unknown save by a few garbled extracts, prohibited, confiscated, burned, and generally prosecuted and inveighed against by emperors, popes, theologians, and fanatics generally, from Justinian down almost to our own day, as perhaps no other book has ever been. In our own times, however, its value begins to be recognized by great scholars, not merely as the only source of the knowledge of Judaism, but as the chief source—next to the gospels—even for the history of the origin and early days of Christianity; a notion long ago hinted at by eminent divines like Lightfoot and others. See also JEWS, MIDRASH, MISHNA, HALACHA, HAGGADA; and an important essay in the *Literary Remains* of Em. Deutsch, author of the above article.

TALPIDÆ. See MOLE.

TALUS, a term employed in geology, to designate the sloping heap which accumulates at the base of a rock or precipice, from fragments broken off by the weather, or materials in any way carried over it. The term is also applied to the slope of a wall which diminishes in thickness as it rises.

TAMA, a co. in e. central Iowa; drained by Iowa river and Wolf creek; crossed by the Burlington, Cedar Rapids and Northern, and the Chicago and Northwestern railroads; 720 sq. m.; pop. '90, 21,651, chiefly of American birth, with colored. The surface is in great part prairie; oats, wheat, hay, corn, and pork are the staples. Co. seat, Toledo.

TAMANDUA, a species of the genus *myrmecophaga* or ant-eater (q.v.). The great ant-eater or *M. jubata* of Linnæus, is called tamandua by the Portuguese, but ant-bear by the English and Spaniards. The proper tamandua, so called by the Portuguese of Brazil, is the *M. tamandua* of Cuvier, and is much smaller than the great ant-eater, being about the size of a large common cat, and its head is not so disproportionately long, although it has much resemblance, and the same kind of snout and nostrils. Its length, from the root of the ear to the muzzle, is 5 inches. The greatest circumference of the head, just in front of the ears, is a little over 8 inches. The conformation of the extremities, the number of toes, before and behind, are in all respects the same as the great ant-eater, but it differs in having a prehensile tail, which is covered with short hair, as is also the body, while the great ant-eater has long, shaggy hair, and a bushy tail. The eyes of the tamandua are very small, as are also the round ears. The legs are short and robust. There are several varieties, chiefly distinguished by differences of color. It is a native of the thick forests of tropical America, and is said never to be found on the ground, but exclusively in trees, where it lives upon ants, honey, and it is said, even bees. When going to sleep it hides its muzzle in the fur of its breast, places its belly on a limb, and wraps the whole around with its tail. The female, as is the case with the great ant-eater, has two pectoral mammæ and bears but a single cub at a birth, which she carries about on her shoulders for the first three or four months. It has a strong, disagreeable odor, which is perceptible at a great distance, especially if the animal is irritated. It is called *fourmillier* by the French, and little ant-bear by the English.

TAMAQUA, a borough in Schuylkill co., Pa.; on the Little Schuylkill river, and the Central of New Jersey and the Philadelphia and Reading railroads; 16 m. n.e. of Pottsville, the co. seat. It has a high school, national and state banks, electric lights, water-works supplied by gravity, several foundries and machine shops, powder, flour, and planing mills, and weekly newspapers, and has large interests in important coal mines in the vicinity. Pop. '90, 6054.

TAMARACK. See LARCH.

TAMARA SPICE, a favorite mixture of condiments used by the Italians. It consists of powdered cinnamon, cloves, and coriander seeds in equal parts, and half the same quantity of aniseed and fennel-seed powdered.

TAMARIN, *Midas*, a genus of South American monkeys, small and beautiful, with short muzzle, prominent forehead, long nails, which, except on the hinder thumbs, are formed like claws, the tail longer than the body, not prehensile, and covered with hair so as to resemble the tail of a squirrel. The **SILKY TAMARIN** or **MARAKINA** (*M. rosalia*), is the best known of the genus. It is of a golden yellow color, with fine silky hair, of which it is exceedingly careful, to keep it free from stain. It is often brought to Europe, but is very tender, and seldom lives long. It is a very gentle and playful creature. The hair of the head and neck is elongated, so as to form a wig or mane.

TAMARIND, *Tamarindus Indica*, a beautiful tree, of the natural order *leguminosæ*, suborder *Cæsalpinieæ*, a native of the East Indies, but now very generally cultivated in warm climates. Only one species is known (*T. Indica*), a spreading tree, 30 or 40 ft. high, with alternate pinnate leaves, which have from 12 to 15 pair of small leaflets, and fragrant flowers, with three petals, the pods brown and many-seeded, as thick as a man's finger, and about six in. long. The pods are filled with a pleasant, acidulous, sweet, reddish-black pulp. It is brought to Europe, mixed with seeds and fibers, in the form of a mass resembling jam, from the East and West Indies, and the Levant. Tamarinds are generally preserved by throwing hot syrup on the ripe pulp; but a better method is to put alternate layers of tamarinds and sugar in a stone jar, the color and taste being thus more like those of the fresh pulp. The wood of the tamarind tree, and especially of its roots, is a cabinet wood of much beauty, but of extreme hardness, so that it is wrought with difficulty.—The pods of some other trees of genera allied to *Tamarindus* are filled with a similar pulp, which is used in the same way, as the tamarind plum of India (*dialium Indicum*), and the brown and velvet tamarinds of Sierra Leone, species of *codarium*. See *illus.*, **TEA**, ETC.

On chemical analysis, tamarind pulp is found to contain citric, tartaric, and malic acids; potash, sugar, vegetable jelly, etc. As a salt of copper is a common adulteration, a piece of polished iron (a knife, for example) should be plunged into the pulp, and left in it for an hour, when, if copper be present, it will be deposited on the iron. Tamarind pulp is refrigerant and gently laxative; and in combination with more active remedies, is often employed in the diseases of children. It is used in India as a cooling article of food, and a kind of sherbet is also formed from it; it is also an excellent addition to curries. Tamarind tea is made by infusing tamarinds in boiling water; when cold, it forms an agreeable and cooling drink in inflammatory or febrile disorders. Tamarind whey is prepared by boiling one ounce of tamarinds with a pint of new milk, and straining: this also is an excellent cooling drink in similar cases.

TAMARISK, *Tamarix*, a genus of plants of the natural order *tamaricaceæ*. This order contains rather more than forty known species, all natives of the warmer parts of Europe and Asia, and of Africa, generally growing in arid situations. Some of them are herbaceous, others are shrubs or small trees, with rod-like branches, scale-like leaves, and small flowers in close spikes or racemes. The calyx has four or five segments; the corolla four or five petals; the stamens are hypogynous, equal in number to the petals, or twice as many; the pistil has three styles; the fruit is a one-celled capsule, with numerous hairy seeds. The **COMMON TAMARISK** (*T. Gallica*) grows in sandy places in the countries near the Mediterranean, and has been naturalized in some places on the southern coast of England. It sometimes attains a height of 30 feet. The twigs seem to possess tonic properties, and their medicinal virtues were once in high repute. The ashes of this and some other species of the genus contain much sulphate of soda.—The **ORIENTAL TAMARISK** (*T. orientalis*) is one of the few trees to be seen in the Arabian and African deserts, with the sands of which it seems to struggle more than any other tree or shrub. Its leafless appearance accords with the surrounding desolation. It is called *atlé* or *ethel*, and its wood is used both for fuel and for many economical purposes.—Galls are found on some species in India, and are valued both for medicinal use and for dyeing. *T. mannifera*, perhaps a variety of *T. Gallica*, yields the kind of manna (q.v.) known as Mt. Sinai manna.—The **GERMAN TAMARISK** (*myricaria Germanica*) belongs to another genus of this order.

TAMATAVE, a t. on the e. coast of Madagascar, in lat. 18° 10' s.; long. 49° 28' 30" e. pop. about 15,000. The town is approached through narrow channels formed by coral reefs; is surrounded by palisades, and is the principal port on the island. The dwellings of the natives are of simple construction, with thatched roofs. The principal trade is from the interior; its exports are india rubber, cattle, swine, tobacco, rice, raw silks, mats, woods, baskets, and hides.

TAMAULIPAS, a state in e. Mexico, bounded on the n. by Texas, on the e. by the gulf of Mexico, on the s. by Vera Cruz, and on the w. by Nuevo Leon and San Luis Potosi, drained by the Rio Grande del Norte, the Santander, the Tampico, the Fernando, and other streams; 32,128 sq. m.; pop. '95, 204,206. Capital, Ciudad Victoria.

TAMBERLIK, ENRICO, tenor singer, was born at Rome in 1820, appeared first in Naples in 1841, and visited various parts of Europe, taking leading tenor parts with great success. He also traveled in North and South America. In 1869 he established a manufactory of firearms at Madrid. He died at Paris, March 14 1889.

TAMBOUR (Fr. *tambour*, drum), a frame upon which muslin or other material is stretched for embroidering. The tambour frame originally was made round. Tambour-work was extensively employed, for the decoration of large surfaces of muslin, etc., for curtains and similar purposes; but pattern-weaving has been brought to resemble it so closely, that it is being rapidly superseded.

TAMBOURINE, a very ancient musical instrument of the drum species, much used by the Biscayan and Italian peasants at their festivities, and sometimes introduced into orchestral music where the subject of the piece is connected with a people who use it, as the Basques, gypsies, or peasants of the Abruzzi. It is composed of a piece of parchment, stretched on the top of a hoop furnished with little bells, and is sounded by the hands, fingers, or elbow. When sharply struck by the hand, the tambourine has not much effect, unless used in numbers.

TAMBOV, a province in the s.e. of Great Russia, bounded on the e. by the governments of Penza and Saratov. Area, 25,710 sq. m.; pop. '93, 2,900,646. The southern districts are hilly; the interior is a somewhat elevated plateau, with a gradual slope toward the north. Several lakes are found in the n. of the government and the principal streams are the Tsna, an affluent of the Moksha, and the Moksha, which is itself an affluent of the Oka.

TAMBOV, capital of the government of the same name, on the Tsna, 750 m. s.e. of St. Petersburg. It was founded in 1636 under the czar Michael Theodorovitch, and served as a fortress against Tartar invasion. It is regularly built, and, though the houses are mostly of wood, there are several important institutions, as the college, a theological seminary, a high school for women, the military hospital, etc. Tambov is the seat of considerable manufacturing trade. Pop. '94, 36,243.

TAMBURINI, ANTONIO, b. Italy, 1800; made his début as a singer at Bologna in 1818. He soon gained a high reputation in Italy, and increased it in London and Paris, where he appeared in 1832. He had a powerful baritone voice, and was a good actor. He sang for several seasons in Bellini's *Puritani*, with Grisi, Lablache, and Rubini. His best part was "Don Giovanni." He retired from the stage in 1854, and took up his residence in France. He d. 1876.

TAMERLANE. See **TIMÜR**.

TAMIL' (more properly spelled *Tamir'*, but erroneously written *Tamul*, and erroneously termed by the earlier Europeans "the Malabar") is the name of the language earliest cultivated of all the idioms which the Rev. R. Caldwell designates as Dravidian—this term comprising, according to him, besides the Tamil, the Telugu; Canarese; Malayalam, or Malayârma; Tul'u, or Tul'uva; Toda, or Tuda, or Tudava; Kôta; Gônd; and Khond, or Kund, or Ku. "The Tamil language," this learned author says in his *Comparative Grammar of the Dravidian or South-Indian Family of Languages*, "is spoken throughout the vast plain of the Carnatic, or country below the Ghauts, from Pulicat to cape Comorin, and from the Ghauts, or central mountain-range of southern India, to the bay of Bengal. It is also spoken in the southern part of the Travancore country, on the western side of the Ghauts, from cape Comorin to the neighborhood of Trivandrum; and in the northern and north-western parts of Ceylon, where Tamilians commenced to form settlements prior even to the Christian era, and from whence they have gradually thrust out the Singhalese. All throughout Ceylon, the coolies in the coffee-plantations are Tamilians; the majority of the money-making classes even in Colombo are Tamilians; and ere long the Tamilians will have excluded the Singhalese from almost every office of profit and trust in their own island. The majority of the domestic servants of Europeans, and of the camp-followers in every part of the presidency of Madras being Tamil' people, Tamil' is the prevailing language in all military cantonments in southern India, whatever be the vernacular language of the district; hence, at Cananore, in the Malayâla country; at Bangalore, in the Canarese country; at Bellary, in the Telugu country; and at Secunderabad, where Hindustani may be considered as the vernacular, the language which most frequently meets the ear in the bazaar is the Tamil'. The majority of the *Klings*, or Hindus who are found in Pegu, Penang, Singapore, and other places in the further east, are Tamilians. . . . Including Tamilians resident in military stations and distant colonies, and the Tamil'ian inhabitants of s. Travancore and northern Ceylon . . . the people who speak the Tamil' language may be estimated at *about ten millions*." "Tamil' includes two dialects, the classical and the colloquial, or the ancient and the modern, called respectively the Shen-Tamil' and the Kod'un-Tamil'. The former is the language of poetry and of the ancient inscriptions; it contains fewer words borrowed from the Sanskrit than the colloquial Tamil', and among these chiefly such as express abstract ideas of philosophy, science, religion, and technical terms of the more elegant arts; and, in general, it so considerably differs from the colloquial Tamil' that it is almost unintelligible to the unlearned Tamil'ian. Of all the Indian languages, Tamil' has the most imperfect alphabet. The latter consists of 12 vowels—viz., *a, â, i, î, u, û, e, ê, o, ô, âi, and aû*—and of 18 consonants—viz., *k, ch, t, t, p, R, ng, n, n', n, m, a final*

n, y, r, l, v, r', l'. Compared to the Devanāgarī alphabet of Sanskrit, it is deficient therefore in the vowels *r'i, r'i,* and *l'i,* though it possesses a short *e* and a short *o*, which the Devanāgarī has not; it has but one sound for *k, kh, g, gh;* for *ch, chh, j, jh;* for *t, th, d, dh;* for *p, ph, b, bh.* It is destitute, moreover, of the Sanskrit aspirate *h,* of the Sanskrit sibilants, *s, s',* and *sh,* and of Answara and Visarga. Of combined consonants, which abound in the Devanāgarī alphabet, it admits only the junction of the nasal and the mute, as *n-t, n'-t',* etc.; doubled nasals, as *n-n, m-m,* etc.; doubled surds, as *k-k, ch-ch,* etc.; also *t'k, t'p, Rk, Rch, Rp, yy, ll, vv,* and *nR,* of triple consonants, only *r'nd* and *gnd.* If Sanskrit derivatives, therefore, are Tamilized, various devices are resorted to in order to separate Sanskrit groups of consonants. Thus, Sanskrit *pṛa* becomes Tamil' *pīra;* Sanskrit *kr'ishn'a* becomes Tamil' *kirut't'ina-n* or *kit't'ina-n* (*t't* instead of *sh*).

The earliest history of the Tamil' country is still involved in obscurity. From evidence afforded by the language, Dr. Caldwell has drawn a sketch which would tend to show that the un-Aryanized Tamil'ians had "kings," who dwelt in "fortified houses," and ruled over small "districts of country;" that they had "minstrels," who recited songs at festivals; but that they were without "hereditary priests," without "idols," and ideas of "heaven, hell, soul, or sin;" yet that they acknowledged the existence of God, whom they styled *kō,* or king, and erected to his honor a temple which they called *kō-il,* or God's house. Their chief worship, however, seems to have consisted in bloody sacrifices which they offered to "the devil." Dr. Caldwell further shows that they were acquainted with the ordinary metals, except tin and zinc, and with the planets known to the ancients, except Mercury and Saturn; that they had medicines, hamlets, towns, ships, and practiced the necessary arts of life, such as cotton-weaving and dyeing, though none of the arts of the higher class, as painting, sculpture, etc.; that they knew no astronomy, and were ignorant of philosophy and grammar. The earliest civilization of the Tamil'ians is traditionally attributed to the influence of successive colonies of Brahmans from upper India; and the leader of the first colony is said to have been the Rishi (q.v.) or saint *Agastya,* a personage who plays an important part in Brahmanical legends. He is called the first king of the Pāndiya kingdom, which was situated near the southern extremity of the peninsula; and by the majority of orthodox Hindus he is believed to be still alive, though invisible to ordinary eyes. His era is supposed to belong to the 6th c. B.C.; though, like all other ancient Hindu dates, this date, too, cannot be fixed with any degree of certainty. Whether the Vedic worship (see VEDA) was ever known in the Tamil' country may be matter of doubt; the worship introduced by the Brahmans seems, on the contrary, to have been that based on the incarnations of Vishn'u (q.v.) and S'iva (q.v.), and therefore to belong to an advanced stage of Hinduism. Vaishn'avas, S'aivas, and S'āktas (see INDIA) are the now prevalent sects of the Tamil' country; for the Jainas (q.v.), who flourished in the Pāndiya kingdom, probably from the 8th or 9th c. to the 12th or 13th after Christ, were finally expelled from it; and only a few adherents of this sect may now be met with there.

The oldest Tamil works are, however, those written, or claimed to have been written, by the Jainas; and it is a remarkable fact that at any period of Tamil' literature few Brahmans have contributed anything to it that may be deemed worthy of preservation. The finest composition which Tamil' possesses is the *KuRai'* of Tiruvalluvar, "a work consisting of 1330 distichs or poetical aphorisms, on almost every subject connected with morals and political economy." Dr. Caldwell holds that it is not later than the 9th c. after Christ. A commentary on this work by Parimelaraṅgar is the most classical production which has been written in Tamil' by a Brahman. Besides the *KuRai'*, the following works are said to have received the sanction of the Madura college, which, according to tradition, founded by Vamsa S'ekhara for the cultivation of the Tamil' language and literature, was then probably the most celebrated seat of learning in all Hindustan. Their names are: *Naladiyar, Nanmanikkadikai, Iniyavai Narppatu, Inna Narppatu, Kar Narppatu, Kallavali Narppatu, Tokai, Tirikadukam, Asara Kovai, Pala Moli, Siru Pansa Mulam, Mutu Moli Kanji,* and *Elati.* For a list of other and later works written in Tamil', both mediæval and modern, embracing the topics of religion—Protestant theology, Roman Catholic theology, Hinduism, and books published by Mohammedans—jurisprudence, philosophy, science, arts, literature, philology, geography and history, periodicals and newspapers, see the very useful *Classified Catalogue of Tamil'-printed Books, with Introductory Notices,* compiled by John Murdoch (Madras, 1865); and for learned purposes, the invaluable *Comparative Grammar of the Dravidian or South-Indian Family of Languages,* by Rev. R. Caldwell (Lond., 1856).

TAMMANY, SOCIETY OF. Societies bearing this name in honor of a Delaware chief who died in the latter part of the 18th c., were about that time established in Philadelphia, New York, and other cities; but that organized in New York, May 12, 1789, was the only one that survived and still exists. This society, originally charitable, became diverted to political uses; and, in the hands of the democratic party, grew to be the recognized head of that organization, and to occupy a position in local elections which, ultimately, became apparently impregnable. The connection of many of its members with the "Tweed ring" scandal brought it into disrepute, though it regained much of its former power as the memory of that incident died away. The political struggle of 1880, and again of 1884, sapped its strength, but only for a time.

The Tammany society made its headquarters for many years in a building which occupied the site of the New York Sun building on Park row. It eventually erected its present building in East Fourteenth street, where its meetings take place in a commodious public hall, a smaller room in the structure being used as a German theater. The society has a committee in every assembly district in the city, and a central committee, numbering more than 2000 members. The latter committee controls the nominations, and, to a large extent, the party-vote in the city, and, to some degree, throughout the state.

TAMMERFORS, a t. in the s. of Finland, 250 m. (direct line) w.n.w. of St. Petersburg. It is situated on a rapid which connects two lakes, and affords motive-power to an extensive cotton mill employing a large number of hands. There is also a large flax mill, a fine stocking manufactory, and a paper mill. Pop. (1895), 22,169.

TAMMUZ, a word which occurs once in the Bible—viz., Ezek. viii. 14: "And behold, there sat women weeping for Tammuz." The derivation of the word is as problematic as is the meaning itself. The Vulgate (all the other versions give the word unchanged—thereby confessing the universal ignorance on the subject) has Adonis, and this has indeed been accepted as the most credible explanation of this strange name. It probably means the Phenician god Adonis, whose chief temple and worship was at Byblus, but who at an early period had been introduced into Syria, Cyprus, and Greece, where he was connected with Aphrodite. His festivals were partly the expressions of joy, partly of mourning. In the latter the women gave themselves up to the most unmitigated grief over the "lost Adonis," shaved off their hair, and sacrificed their chastity in his temples. The days of mourning were completed by a solemn burial of an image of the god. This period was followed by a succession of festive and joyful days, in honor of the resurrection of Adonis. The river Adonis (Nahr Ibrahim) (see PHENICIA), which once a year "ran purple to the sea" from the Lebanon, was supposed to be tinged by the blood of the god; and a vessel sent off from Alexandria, and carried by the tide to Byblus, used to inform the mourners by letter that he had been found again. There is no doubt that the different phases of the year, or rather the disappearance and reappearance of the enlivening rays of the sun, and their influence upon all nature (see OSIRIS), were symbolized in these originally poetical, afterward licentious and fanatical rites. The time of the year at which these feasts were celebrated has given rise to much dispute. Most probably, they took place at the summer solstice; and the designation of a Hebrew month as Thamuz—which falls about our August—seems further to favor this opinion.

TAMPA, city and co. seat of Hillsboro co., Fla.; on Tampa bay, the Hillsboro river, and the Florida Central and Peninsular and the Plant system railroads; 30 miles e. of the gulf of Mexico. It is a port of entry, with a fine harbor; is principally engaged in the manufacture of cigars; and has electric lights, electric street railroads, waterworks supplied from springs, national banks, convent of the Holy Names, female seminary, public and private schools, numerous hotels, and daily, weekly, and monthly periodicals. Pop. '90, 5532.

TAMPA BAY, on the w. coast of Florida; an inlet from the gulf of Mexico; 40 m. long, and varying from 6 to 15 m. in width, the n. part being divided into old Tampa and Hillsboro bays. Its entrance is protected by a line of keys, or low islands, and it forms an excellent harbor. It contains a number of small islands, and fish and turtle in great abundance.

TAMPAN, a tick (q. v.) of s. Africa, remarkable for its very poisonous bite, found in Angola and the country southward from it, and described by Livingstone in his *Travels*. It attacks by preference the parts between the fingers or toes. It attains the size of a pea, and when it has satiated itself with blood, is of a dark-blue color, and its skin so tough, that it cannot be burst by squeezing with the fingers. The first effect of the bite is a mingled sensation of pain and itching, which ascends the limb until it reaches the abdomen, and soon causes either violent vomiting and purging, or fever. The tingling sensation lasts for a week.

TAMPICO, or Santa Anna de Tamaulipas, a sea-port of Mexico, in the state of Tamaulipas, on the Panuco, near its mouth in the gulf of Mexico. Its streets are broad and regular, and among other institutions it contains a custom-house. The harbor, formerly dangerous, has been improved so that vessels drawing 24 feet can enter. There are a number of exports and the trade is constantly increasing. Pop. '89, 8000.

TAMPION, the wooden plug placed in the mouth of a piece of ordnance to preserve it from dust and damp.—In naval gunnery the tampion is the wooden bottom for a charge of grape-shot.

TAM-TAM, an Indian musical instrument, resembling the tambourine (q. v.), but larger and more powerful, and oval instead of round. It has been occasionally introduced into orchestral bands.

TAMUS. See BRYONY.

TAMWORTH, a municipal borough and market town, partly in the county of Stafford, partly in that of Warwick, at the confluence of the Tame and Anker, 13 m. n.e. of Birmingham. Of the ancient church the transepts are Norman; the remains of the ancient castle, to which modern additions have been made, are in various styles. Brickmaking,

brewing, dyeing, wool-stapling, and manufactures of tapes and small wares are carried on. There is a bronze statue to the late Sir Robert Peel, erected in 1852. Pop. '91, 6614.

TANAGER, *Tanagra*, a genus of birds of the finch family *fringillidae*, having a conical beak, triangular at the base; the upper mandible notched toward the tip, and its ridge arched. The species are numerous, and the Linnæan genus has been divided into a number of genera, all of which possess the characters just given, and popularly receive the name tanager. All of them are American, and most of them belong to warm regions; but some visit more northern parts of America as birds of passage. Many of the tanagers are birds of very beautiful plumage, and many have good powers of song. The **ORGANIST TANAGER** (*T. or euphonia musica*) is particularly famous for its rich full tones.

TANAKA FUJIMARO, b. in the province of Owari, Japan, about 1843. During the revolution of 1868 was one of the leaders in the cause of progress. He was made vice-minister of education in 1871, and visited America and Europe on an educational mission. On his return to Japan he zealously devoted himself to perfecting a plan of national education by which nearly 3,000,000 Japanese youth of both sexes now attend public-school. In 1876 he again visited the United States to observe the system of education, representing Japan's educational progress at the Centennial exposition. On his return to Japan he established in Tokio a museum of education to which American schools and educators largely contributed. In 1879 he was made minister of justice.

TANANARIVA'. See ANTANANARIVA.

TAN-BALLS. A useful way of utilizing the spent bark of the tanner's yard has been adopted in many parts of England: it consists in pressing the bark into balls or lumps, which harden on drying, and serve for fuel.

TANCRED, a Sicilian prince, the son of Eudes, a Norman baron, and of Emma, the sister of Robert Guiscard (see GUISCARD), was one of the celebrated heroes of the first crusade, and was born after the middle of the 11th c. A.D. Some chroniclers profess to detail the events of his early life, describing him as the most accomplished youth of his time in athletic and military exercises, and of a wisdom far surpassing that of men of mature years, and as a partisan of his cousin Bohemond (q.v.) in the quarrel with their uncle, Roger (q.v.) of Sicily. But the first authentic information respecting him is that he raised a large body of men in Apulia and Calabria, and joined Bohemond, then on his way to the first crusade. The two cousins landed in Epirus, and first one and then the other made their submissions to the Greek emperor, Alexis. Tancred's exploits on the way to Syria; his quarrel with Baldwin for the possession of Tarsus, and his subsequent chivalrous forbearance to, and rescue of, his rival; his wondrous valor before Antioch, where he killed no fewer than 700 infidels, transmitting the heads of 70 to the pope, and receiving a corresponding number of marks of silver in return; his vigorous repulse of the first sortie by the infidels from Jerusalem; his sad and lonely vigil on the mount of Olives; and his gallantry at the storming of the sacred city, are all detailed by the numerous chroniclers of this epoch, in their usual style of extravagant laudation, but with a harmony which speaks favorably for their correct appreciation of his character. He was one of the claimants of the throne of Jerusalem, and was pacified by Godfrey (q.v.), the successful competitor, with the gift of some towns in Palestine, and the principality of Galilee or Tiberias. A brief quarrel with Baldwin, after Godfrey's death, petty combats with the infidels, and occasional wars with the other Christian princes who had settled in Syria and Palestine, occupied the remainder of his life, which was brought to a close at Antioch in 1112. Besides his own principality, he governed that of Antioch, belonging to his cousin Bohemond, from 1100. The fiery and energetic, but at the same time pious, sagacious, and forbearing chief whom the chroniclers present to us has been considerably toned down by Tasso in his *Jerusalemme Liberata*.

TANEY, a co. in s. Missouri, adjoining Arkansas; drained by White river and several creeks; 660 sq.m.; pop. '90, 7973, chiefly of American birth, with colored. The surface is rough, heavily wooded, and moderately fertile; corn, wheat, hay, and pork are the products. Copper and lead are found. Co. seat, Forsyth.

TANEY, ROGER BROOKE, LL.D., 1777-1864; b. Md.; graduated at Dickinson college, Penn., 1795; studied law, and in 1799 was admitted to the bar. He practised in Calvert co. and Frederick, removing to Baltimore in 1822. He was attorney-general of the state in 1827, and in 1831 President Jackson made him attorney-general of the United States. Two years later he was nominated to succeed Duane as secretary of the treasury, but on account of his opposition to the U. S. bank the appointment was not confirmed by the senate. The senate also refused, 1835, to confirm his appointment to the supreme court bench, but two years later he succeeded Chief-Justice Marshall and ably sustained the high reputation for legal profundity and acumen which the supreme court had gained under his immediate predecessor, though the events of the war have overthrown many of the positions then taken. Many most important decisions on constitutional questions were given by him, the most noted being that in the "Dred Scott" case (q.v.). This decision, with the accompanying expression of opinion, had much to do with the discussions and animosity which resulted in war. When in the spring of 1861 application was made to Taney for a writ of *habeas corpus* in the case of a Baltimore citizen who had been arrested by a U. S. officer on a charge of treason, he at once granted it,

denying the right of the president to suspend the *habeas corpus* act. A memoir of Taney's life, in part an autobiography, was published, 1872, by Prof. Samuel Tyler. A bronze statue of him, executed by Rhinehart for the state of Maryland, stands in the city of Annapolis.

TANGANYIKA, a lake of eastern central Africa, lying between lat. 3° and 9° s. Long. of center, 30° e.; surface, 2,710 feet above the sea; length, 400 m.; breadth, from 10 to 50 miles. It was discovered by Speke and Burton in 1858. In 1871 Livingstone confirmed Burton's conclusion, that the Rusi Zi flows into its n. extremity. Cameron surveyed the s. and w. coasts in 1874, and discovered an outlet, the Lukuga, on the w. side. In 1876 Stanley satisfied himself that this channel, which he proved to communicate with the Lualaba or upper Congo, is generally dried up in certain parts of its course. Area, 12,170 sq. m. See Peters, *Deutsch-Ostafrikanische Schutzgebiet* (1895).

TANGENT. See TRIGONOMETRY.

TANGHIN, *Tanghinia venenifera*, or *cerbera tanghin*, a tree of the natural order *apocynaceæ*, a native of Madagascar. The fruit is a drupe, of which the kernel is so deadly a poison, that although not larger than an almond, one kernel is sufficient to destroy twenty people. It was used in Madagascar as an ordeal for the discovery of guilt or innocence, and with the general result of the death of those subjected to it. A little of the powdered kernel was placed on the tongue of the suspected person, and he was obliged to swallow it. Only those recovered whose stomachs quickly rejected the dose. The progress of Christianity and civilization in Madagascar has led to a discontinuance of the use of this ordeal. A similar poison-ordeal is used in some parts of Africa. See ORDEAL and ERYTHROPHLÆUM.

TANGIER, a sea-port of Morocco, on a small bay or inlet of the strait of Gibraltar, 38 m. s.w. of the town of that name. It is a small, ill-built town, situated on two hills; the houses—with the exception of the residences of foreign officials—being, as a rule, miserable edifices, and the streets being narrow and dirty. The town is surrounded by old walls and protected by several forts. It has an extensive shipping trade—the annual value of the entering and clearing cargoes being, according to recent accounts, above \$4,000,000. Tangier was taken by the Portuguese in 1471, ceded to the English in 1662, and held by them for 22 years. Pop. estimated at 20,000.

TANGIPAHOA, a co. in s.e. Louisiana; bounded on the n. by Mississippi, on the s. by lakes Pontchartrain and Maurepas; drained by the Tangipahoa river; traversed by the Chicago, St. Louis and New Orleans railroad; about 780 sq.m.; pop. '90, 12,655, inclu. colored. The surface is flat. The soil is sandy, but fertile in some parts. The principal productions are corn, rice, potatoes, and cotton. Co. seat, Amite City.

TANGLE, the common name of *laminaria digitata* and *l. saccharina*, two species of sea-weed, natives of the British shores, growing on rocks in deep water. The stem is woody, the frond leathery, flat, and without a midrib. The woody stems are sometimes used for knife-handles, the blade being stuck in when the handle is soft, and held fast by its shrinking as it dries. The young stalks form an article of food and are nutritious, owing apparently to the large quantity of gelatinous matter which they secrete. They are also used for feeding cattle. *L. potatorum*, a large species, supplies the aborigines of Australia with instruments, vessels, and food.

TANIS. See ZOAN

TANIS, the Tyrian name of the goddess Astarte (q.v.).

TANISTRY, an ancient Celtic custom of succession, which is generally described as devolving the right to inherit lands or honors on the oldest and worthiest of the blood. The tanist, or righdomna, was the heir-apparent of the monarchy, whom it was the practice to appoint during the lifetime of the sovereign; and there is no doubt that the nearest to the original stock was held to have a preferable claim, as contended by Bruce in his claim to the Scottish throne. The practice of electing a successor was also applied to the inheritance of land, and to succession to ecclesiastical offices.

TANJUR, more commonly written TANJORE, an important town of India, in the presidency of Madras, 180 m. s.s.w. of the city of that name, in the midst of an extensive plain, on one of the branches of the delta of the Kaveri. The town comprises two forts and several suburbs. The former are so connected that they may almost be regarded as one. The smaller of the two is a parallelogram in shape, and 600 yards in extreme length. It is joined on the north to the larger fort, which is circular in shape, and 1100 yards in greatest diameter. The walls of both are lofty and strong, and are surrounded by a ditch cut out of the solid stone. The principal edifices of Tanjur are the great pagoda, esteemed the finest specimen of a pyramidal temple in Hindustan (see INDIAN ARCHITECTURE), and the palace of the rajah. Silks, muslins, and cottons are manufactured. Pop. '91, 54,390. The province of Tanjur, of which the town of the same name is capital, has an area of 3,654 sq.m., and contained, in 1881, 2,000,000 inhabitants.

TANK-WORMS. The mud in Indian tanks has been found to abound in *filaria*, some of which closely resemble the guinea-worm infesting the human body. Although there is no positive evidence, there is extreme probability that these tank-worms are the origia

of the guinea-worm. Dr. Carter, who has had much personal observation of the guinea-worm in India, "argues, and apparently with good reason, *no tank-worm, no guinea-worm*. Persons who bathe in water in which the former is found may expect to have the latter." Mr. Bastian, who has written an excellent paper on the anatomy of the guinea-worm, states that there is an undoubted anatomical relation between it and the tank-worm. The real difficulty in the theory is that these tank-worms are widely diffused, while the guinea-worm is restricted in its localization.

TANNAHILL, ROBERT, was b. on June 3, 1774, at Paisley, where his life was almost entirely passed in the humble occupation of a weaver. Very early he exhibited a taste for poetry, and out of his constant study of the works of Burns, Ferguson, and Ramsay, the ambition was developed in him of emulating these favorite authors. His poetry soon became known, and procured him a local celebrity, which on the publication, in 1807, of a collection of his pieces (*Poems and Songs*; new and larger ed., with a memoir of the author, Glasgow, 1838), was ratified by a wider acceptance. But while his modest fame was extending itself, his life had an abrupt termination. He was found one morning (May 17, 1810) drowned in a canal near Paisley; and there seems almost no reason to doubt that his death was that of the suicide. A morbid melancholy which seems to have been inherent in his nature had gradually been growing upon him, and clouding his life with hopeless gloom. He died at the age of 36.

As a song-writer, Tannahill continues to be remembered; and some few of his best pieces have established themselves as part of the musical repertory of the Scottish people. He has a genuine lyrical gift, much tenderness of sentiment, and a true eye and feeling for the simple effects of nature with which he was familiar. Of the force and passion of Burns, he has nothing; but in grace and sweetness, Burns himself has scarcely perhaps surpassed certain of his happier passages.

TANNER CREEK, a magisterial dist., Norfolk co., Va. Pop. '90, 4966.

TANNHÄUSER, the subject of one of the most attractive German legends of the middle ages, is a knight who, in the course of his travels, comes to Venusberg (q.v.), and enters the cave-palace, to behold the wonders of the lady Venus and her court. After having lived there for some time in every kind of delight, his conscience smites him. Invoking the Virgin Mary, he obtains leave of absence, and makes a pilgrimage to Rome, to pope Urban, to seek, through confession and penance, remission of his sins, and escape from damnation. But the pope, who happens to have a wand in his hand, tells him that he can as little obtain God's mercy as that dry wand can become green again. Thereupon Tannhäuser departs in despair, and returns to the lady Venus in the mountain. Three days afterward, however, the wand begins to sprout and bear green leaves; and the pope immediately sends out messengers to every country, but in vain—Tannhäuser can nowhere be found. Such is the story as told in the popular ballad once common all over Germany, and even beyond it, and sung in the district of Entlibuch as late as the year 1830—the best version of which is in Uhland's *Alte hoch- und niederdeutschen Volkslieder* (Stuttg. 1845). In the preface of the *Heldenbuch*, it is further added, that "the faithful Eckhart"—a character in German heroic legends—sits before the mountain, and warns the people of its dangers. In this shape, the story may be traced as far back as the 14th c.; but the substance of the legend is much older, and goes back to the days of German paganism. Some traditions connect it with the Heselberg or Hørselberg, near Eisenach, in which the lady Holle or Holda (see BERCHTA) held her court, who, on her part again, seems to be identical with Freyja, the Scandinavian Venus. The peculiar mythological meaning of the saga, which has numerous points of contact with many other German traditions, has, however, never yet been thoroughly inquired into. Grimm sees in it a touching portrayal of the regret that lingered in the popular heart after the departing paganism, and of the sternness of the Christian priesthood in regard to it. Compare Kornmann, *Mons Veneris* (Fkf. 1614); Grässe, *Die Sage vom Ritter Tannhäuser* (Dres. and Leip. 1846). In later times, the saga has been put into poetical form, among others by Tieck, and made use of by R. Wagner in an opera. This idea of subterranean palaces in which the king or queen of dwarfs, pigmies, fairies, and so forth, held their court, seems to have been universal. Everywhere, stories are told of men being enticed to enter, and finding it difficult or altogether impossible ever again to obtain their liberty. See THOMAS THE RHYMER. The visit of Ulysses to the isle of Calypso, and that of Circe, appear to be only modifications of the same idea.

About the middle of the 13th c., and contemporary with Pope Urban IV. (Urban IV., 1261-65), there lived in reality in Germany a Bavarian knight named Tannhäuser, who, as Neidhart relates, after returning from the wars, resided as minnesinger (q.v.) at the court of the Austrian duke Frederick II. the quarrelsome. At the duke's death, and after having wasted his substance in dissipation, he resided partly with duke Otto II. of Bavaria, and partly led a wandering life. Tannhäuser has composed fine spirited ballads, which, however, show the decay that had already set in in the minnesinger's art. Tannhäuser's memory was held in high regard by the meistersingers, who also preserved one of his measures; and it is quite possible that this Tannhäuser may have been introduced into popular fiction, and have had his name worked into a myth, in which there is some resemblance to his actual fortunes; in which process, however, that old myth became transformed into the more modern saga. The poems of Tannhäuser are published partly in the second part of the *Minnesinger* (published by Von

der Hagen, Leip. 1838), and part.y in the 6th vol. of Haupt's *Zeitschrift für Deutsches Alterthum* (Leip. 1848).

TANNIC ACID. or **TANNIN.** Under these synonymous terms, chemists include a number of solid non-nitrogenous substances, consisting of carbon, hydrogen, and oxygen, some of which are crystalline, and others amorphous, and possessing no smell, but a well-marked astringent taste. They are soluble in water and alcohol, the solutions being acid, and yielding precipitates with most metallic oxides. A solution of gelatine is also precipitated by a solution of any of the tannic acids, and the gelatinous tissue in raw hides is by an analogous process converted into leather. See **GALLOTANNIC ACID.** None of these acids are volatile; and when exposed to the action of heat, they decompose, and yield the so-called pyro-acids. The persalts of iron yield bluish-black or green precipitates with the tannic acids.

The members of this group are widely diffused throughout the vegetable kingdom. "The bark and leaves of most forest trees, such as the oak, the elm, the willow, the horse-chestnut, and the pine—and of many fruit trees, such as the pear and plum, contain tannin in notable quantity. The wood and bark of many shrubs, such as the sumach and whortleberry, and the roots of the tormentilla and bistort, are also powerfully astringent, owing to the presence of one of the forms of tannin. Coffee and tea, as well as Paraguay tea, likewise contain a modification of this principle. All these bodies, except coffee, precipitate the persalts of iron of a bluish-black color; or, if a free acid be present, the solution assumes a dark-green color."—Miller's *Organic Chemistry*, 2d ed. p. 400. The variety of tannin, or tannic acid, occurring in catechu and kino, produces a green precipitate with the persalts of iron; while that occurring in matricaria, rhatany, and the common nettle, produces a gray precipitate. The principal members of this group are—1. *Gallotannic acid*, or *tannic acid*, $C_{14}H_{10}O_8$ (in the ordinary acceptation of the word), which is mainly obtained from the gall-nut, and has been described in a special article; 2. *Moritanic acid*, $C_{13}H_{10}O_6 + H_2O$, obtained from fustic (*morus tinctoria*); 3. *Quinotannic acid*, $C_{14}H_{10}O_8$, obtained from cinchona bark; 4. *Quercitannic acid*, from oak bark; 5. *Mimotannic acid*, $C_{21}H_{15}O_8$, from catechu; and 6. *Kinotannic acid*, from kino; to which some chemists add a variety occurring in coffee and Paraguay tea, to which the term *caffotannic acid* is given.

TANNING. See **LEATHER.**

TANSY, *Tanacetum*, a genus of plants of the natural order *composite*, sub-order *corymbifera*, allied to *artemisia* (q.v.), and having hemispherical heads of flowers, with the florets all tubular, the receptacle naked, the pappus a slight membranous border. The species are pretty numerous, and are natives of the temperate parts of the old world. COMMON TANSY (*T. vulgare*) is a native of Britain and of continental Europe, growing in fields and by roadsides, river-banks, etc. It has long been generally cultivated in gardens. It is now naturalized, and pretty common in many parts of North America. It is a perennial, from two to four feet high, with great abundance of deep-green, bipinnatifid, inciso-serrate leaves; the flowers in terminal corymbs, yellow, and rather small. The leaves and flowers have a strong aromatic smell and a bitter taste. The young leaves are used for flavoring puddings, cakes, omelets, etc. The plant is also tonic and anthelmintic, and *tansy tea* is an old popular medicine. Some curious old customs still linger in many parts of England connected with the use of *tansy cakes* and *tansy puddings* at Easter, which was originally intended to represent the use of bitter herbs at the paschal feast. In some parishes of the counties of Devon and Dorset the clerk carries round to every house a few white tansy cakes as an Easter offering after divine service on Good Friday, and receives a gratuity from each householder. In former times both ecclesiastics and laics played at ball in the churches for tansy cake at Easter-tide. The highest dignitaries took part in this, and began the ball-playing, which went on during the antiphone, and was accompanied with dancing. After the ball-playing was over, all retired for refreshments; and a gammon of bacon was a standard dish, to signify abhorrence of the Jews. A tansy pudding was an essential part of the feast.—See Chambers's *Book of Days*.

TANTALUM (symb. Ta, new equiv. 182) is a very rare metal, discovered in 1802 by Ekeberg in the Swedish minerals known as tantalite and yttrotantalite. It is so closely allied to columbium or niobium that Wollaston regarded the two metals as identical, a view which was generally adopted till Rose disproved it. As it is of no practical importance, it is unnecessary to enter into any details regarding it.

TANTALUS, a genus of birds of the family *ardeide*, resembling storks in their feet and bill, except that the ridge of the bill is rounded, and its tip gradually curved downward, and slightly notched on each side; a portion of the head, and sometimes of the neck, is bare. The AFRICAN TANTALUS (*T. ibis*) was long regarded as the ibis (q.v.) of the ancient Egyptians, but it is rare in Egypt, and belongs chiefly to Senegal. It is much larger than the true ibis. The AMERICAN TANTALUS, or WOOD IBIS (*T. loculator*), is as large as a stork, but more slender, white, with black quill and tail feathers, the naked skin of the head and neck black. It is found both in North and in South America. In the United States it chiefly inhabits the swampy districts of the south.

TANTALUS, a character noted in Greek mythology for the punishment he suffered in the lower world. He is said to have been the son of Zeus by Pluto, and some accounts describe him as king of Argos or Corinth. Various reasons are assigned for his undergoing the severe punishment which he did, the most common being that he divulged the divine counsels of Zeus, which the latter had communicated to him as secrets. In the lower world he was afflicted with an insatiable thirst, and had to stand up to the chin in a lake, the waters of which receded whenever he tried to drink of them. Clusters of fruit hung over his head, which eluded his grasp whenever he endeavored to reach them, his mind at the same time being kept in a state of constant terror lest a huge rock, suspended above his head, and ever threatening to fall, should crush him. Tantalus, or rather the punishment which he suffered, has supplied the English language with the very significant verb, "tantalize." Tantalus was the father of Pelops, Broteas, and Niobe.

TANTIVY is a hunting term denoting "at full speed." It is formed to resemble in sound the note from a hunting-horn. "To ride *tantivy*" is to ride at full speed.

TANTRA (from the Sanskrit *tan*, to believe, to have faith in; hence, literally, an instrument or means of faith) is a name of the sacred works of the worshippers of the female energy of the god S'iva. See S'ÂKTAS. A Tantra is said to comprise five subjects—the creation and destruction of the world, the worship of the gods, the attainment of all objects, magical rites for the acquirement of six superhuman faculties, and four modes of union with spirit by meditation. A variety of other subjects, however, are introduced into many of them, while some are limited to a single topic, as the mode of breathing in certain rites, the language of birds, beasts, etc. They always assume the form of a dialogue between S'iva and his wife, in one of her many forms, but mostly as *Umâ* (q.v.), or *Pârvatî*, in which the goddess questions the god as to the mode of performing various ceremonies, and the *mantras*, or prayers and incantations to be used in them. These he explains at length, and under solemn cautions that they involve a great mystery, on no account whatever to be divulged to the profane. The efficacy of these *mantras* is deemed to be all-powerful, and, according to some Tantras, that of the faith in these revelations of S'iva so great, as to free a believer from the consequences of even the most atrocious sins. The followers of the Tantras profess to consider them as a fifth Veda (q.v.), and attribute to them equal antiquity and superior authority. Though such an antiquity, or even one approaching the age of the four Vedas, is entirely imaginary, the question of their date is nevertheless involved in obscurity. As Tantras are referred to in some of the *Purân'as* (q.v.), they must have preceded these; but as, on the one hand, the age of the *Purân'as* themselves is merely conjectural, and as there probably existed older *Purân'as* than those we possess now; and, on the other hand, as there might likewise have been older Tantras, from which the works now so called were compiled, the circumstance that Tantras are quoted by some *Purân'as* would not throw much light on the date of those now extant. It seems more significant, however, that the oldest known author of a glossary of classical words, Amarasinha (see *lexicography*, under SANSKRIT LITERATURE), should have omitted from among the meanings he assigns to the word *tantra*, that of "a sacred book;" whereas the later commentators on his work do not fail to supply this omission, which certainly would have been an extraordinary one had Tantras existed at the time of Amarasinha. If, then, this negative evidence has the value which it seems to have, the Tantras would, at all events, be later than the first centuries of the Christian era. The works of this class are very numerous, and it is to be regretted that Sanskrit philology, which has already investigated, more or less profoundly, nearly all the branches of Sanskrit literature, should hitherto have almost entirely neglected this particular branch of it.

TANTUM ERGO, the hymn uniformly sung in the Roman Catholic church at benediction with the holy sacrament. These are the first words of the penultimate strophe of the hymn *Pange Lingua*. The *Tantum Ergo* is the most popular of all the eucharistic hymns of the Roman Catholic church.

TANZIMAT, or TANSIMAT, the plural of the Arab word *tansim*, generally signifies "regulations," but in a special sense denotes the organic laws established by the Hattî-Sherif of Gulhane, in accordance with which the administration of the Turkish empire is carried on. These organic laws, the first attempt at constitutional government in Turkey, were published by Sultan Abdul-Medjid in 1844, and treat of—1st, the political organization of the empire, and the powers and jurisdiction of the chief officials and higher courts; 2^d, administration and finance; 3^d, justice; 4th, military affairs. But the tanzimat was a dead letter, or nearly so, except in connection with the army; so that on Sept. 7, 1854, the sultan found it necessary to publish a new ordinance, in which the complete carrying out of the tanzimat in all respects was commanded; and a commission was appointed to see that this was done.

TAORMINA (anc. *Tauromenium*), a t. on the e. coast of Sicily, province of Messina, situated on a narrow ledge of rock, 900 ft. above the sea, about 31 m. s.w. of Messina. It consists mainly of a single street, more than a mile in length, is surrounded by a Saracenic wall, has numerous convents and churches, many picturesque palaces and mansions built in the middle ages, and numerous relics of antiquity, among

which are very fine supulchers, an aqueduct, tessellated pavements, remains of a "Nau-machia" and of a theater, the last reckoned one of the most splendid ruins in Sicily, and commanding a view of almost unparalleled magnificence. Taormina has some trade in wine and hemp, and a pop. '81 of 2388.

Ancient *Tauromenium* was built after the destruction of Sicilian Naxos in 403 B.C., but the exact date is uncertain. It rapidly attained prosperity; but its history during the Greek and Roman period presents no striking features.

TAOS, a co. in northern New Mexico, bordering Colorado and having the main chain of the Rocky Mountains for its eastern boundary; 2300 sq.m.; pop. '90 9868. It is drained by the Rio Grande. Co. seat, Taos.

TAPAJOS, an important river of Brazil, and an affluent of the Amazon, is formed by confluence of the Arinos and the Juruena, both of which rise in the south of the province of Matto Grosso. After a northward course of upward of 1100 m. in length the Tapajos falls into the Amazon, about 20 m. below the town of Santarem. In lat. about 7°30' s., it has a fall of 30 ft.; but the interruptions to the navigation, which is said to reach to within a short distance of the source of the river, are few. A portage of only 18 m. separates the upper waters of the Tapajos from those of the Paraguay.

TAPE-GRASS, a popular name for *vallisneria spiralis*. See VALLISNERIA.

TAPESTRY (Fr. *tapisserie*), a kind of carpet-work for decorating walls and furniture. The art of working tapestry is extremely ancient, but we have little information about it until the time of the Saracens, who revived it, and brought it into notice. They, in all probability, only used tapestry as drapery or curtains for the courts of their houses; its use as a covering for walls seems to have been an invention of the Flemings previous to 1606, at which date it was introduced into France by Henry IV., who engaged Flemish artists to teach it. At that period, so generally was its origin attributed to the Saracens that it was called *Sarrazinois*. The oldest piece in existence is that described under the name of the BAYEUX TAPESTRY (q.v.). At first, the Saracenic tapestries were only ornamented with flowers and geometric figures; but the Flemings aimed higher, and sought to enrich them with historic subjects of the highest order; and so important did this art become, that the most eminent masters in painting, from Raphael downward, bestowed their greatest efforts upon cartoons to serve as copies for the tapestry-workers, of which the celebrated Raphael cartoons, formerly at Hampton Court, now in a gallery especially designed for them in the Kensington museum, are illustrations (see CARTOON). After its first introduction into France by Henry IV. at the beginning of the 17th century, the art of making tapestry does not appear to have made much progress until the middle of that century, when a small establishment founded by the brothers Canaye on the premises formerly occupied by Jean Gobelins, a dyer of wool, was commenced, and was afterward carried on by a Dutchman named Gluck and his assistants with such success, that it was suggested by Colbert, the minister of Louis XIV., that it should be taken under the king's patronage; in consequence of which the establishment was bought, and constituted a royal manufactory in 1667, under the management of M. Lebrun, who was the first director. A royal carpet-manufactory had been previously established in 1615; this was called La Savonnerie, from the previous use of the buildings for the manufacture of soap. The Savonnerie and the Gobelins were both carried on with great spirit by successive sovereigns, and were formed into one establishment in 1826, when the works of the Savonnerie were removed to the Gobelins, where this most interesting work is now carried to great perfection, and also at a minor establishment at Beauvais, in the department of Oise, where it is, however, worked in a different style and manner. At the Gobelins, a series of threads are arranged vertically in a frame like the warp of a loom, and the workman stands behind the frame, the pattern being placed behind him for reference. To produce the design, he has a number of wooden needles threaded with wool and silk of the colors required, and these are passed through the upright warp-threads, and brought back, so that each thread becomes covered with the necessary color; and such is the extreme nicety with which this is done, and such the delicacy and multiplicity of the shades of color employed, that but little difference can be detected between the tapestry picture and the painting from which it was copied. At Beauvais, the warp is placed horizontally, and the workman stands over it; this renders it necessary to cut off the ends on the upper surface, which is avoided in the other plan of working from behind. The Beauvais is, however, a style intermediate between tapestry and carpet-work, and the roughness of surface so produced has a good effect. Much fine tapestry was employed in former times in decorating the palaces and mansions of Great Britain, in many of which it is still seen in great beauty. The modern works of the Gobelins were distributed as presents by the late imperial government of France. They are not produced in great numbers, and are of great money value. The number of artists employed is about 120.

TAPEWORM is a word popularly used in a vague sense to designate any worm of the group *cestoidea* (see CESTOID WORMS). According to Dr. Cobbold, upward of 250 distinct forms of cestoid worms have been described, of which probably somewhat less than 200 may be regarded as really good species. These he divides into the three families of (1) *taniadae*, or true tapeworms; (2) *bothriocephalidae*, and (3) *tetrarhynchidae*. For the natural

history of the tapeworms generally, we must refer to the article CESTOID WORMS. We will here only remind the reader of the following points necessary for the due understanding of this article, and that every tapeworm passes through several distinct phases during its life-history. "In the ordinary colonial or tapeworm condition," says Dr. Cobbold, "it has been termed the *strobila* (Van Beneden). The separate joints of which the strobila is composed are denominated *proglottides*, or zooids. The anterior segment forms the *head*, and remains barren, those of the neck and front part of the body being sexually immature during the process of strobile-formation. The mature proglottides at the caudal end are capable of realizing an independent existence, and the eggs which they contain develop the six-hooked embryos, or *proscolices* (Van Beneden), in their interior. These latter become metamorphosed into *scolices* or nurses, representing the well-known cysticercal state, which, in its sterile or aborted condition, forms the common *hydatid*."—*Entozoa*, p. 105. During the greater part of their existence, the tapeworms are parasitic animals, the mature proglottides and eggs being free only during a comparatively short interval. They are mostly restricted in their distribution to the vertebrate animals, comparatively few of the invertebrates (excepting the cuttle-fish) appearing to harbor them in their adult condition, although the tapeworm larvæ, nurses, or *scolices* probably abound in various invertebrate groups. In the human body, no less than ten species of tapeworm occur, viz., eight *true tapeworms*, and two species of *bothriocephalus*; and as four distinct species have been found in the Barbary ape, it is obvious that errors of diet, due to civilization, are not the cause of these parasites. Among the animals with which we are most familiar, the species are plentiful in the common dog (and in true carnivora generally), in rats, and mice. The typical ruminants are almost constantly invested both by mature and immature forms; while the larger pachyderms, and solidungulates (the horse, ass, etc.), harbor only a few adult forms; but only larvæ appear to be known in swine. These worms appear to be as abundant in granivorous birds as in carnivorous hawks, owls, etc. In the water-birds generally, the adult worms are very abundant, their larvæ existing in the food of such birds, in fishes, mollusks, etc. In reptiles, these worms are extremely rare, although other parasitic worms abound; while in fishes they are very abundant both in the adult and larval forms.

The *teniada*, or *true tapeworms*, may be distinguished from the other families of the order *cestoidea* (cestoids or tapeworms in the popular sense) "by the possession of a small distinct head, furnished with four simple oval or round suckorial disks (suckers), and commonly also with a more or less strongly pronounced rostellum (proboscis) placed at the summit in the median line. This prominence, when largely developed, becomes retractile, and when not in use, is lodged within a flask-shaped cavity, lined by a sheath, and supplied with special muscles; it is also very frequently armed with a single or double crown of horny chitinous hooks, there being occasionally as many as five or six separate circular rows of these organs. Attention to the number, relative size, and disposition of the hooks is often sufficient to determine the particular species. In nearly all cases the reproductive orifices are situated at or near the margins of the joints which are bisexual."—Cobbold, *op. cit.*, p. 109. The eight true tapeworms occurring in man are—(1) *Tenia solium*, Linnaeus; (2) *T. mediocanellata*, Küchenmeister; (3) *T. acanthotrias*, Weinland; (4) *T. flavopuncta*, Weinland; (5) *T. nana*, Von Siebold; (6) *T. elliptica*, Batsch; (7) *T. marginata*, Batsch; (8) *T. echinococcus*, Von Siebold.

The common *tapeworm*, *tenia solium*, derives its Linnæan title from the idea that it is always a solitary worm. Although this is commonly, it is not by any means always the case: Küchenmeister has several times found two or three together, and cases are recorded in which 30 and even 40 worms have been expelled from one patient. The full-grown tapeworm (strobila) has been known from the earliest times, and is described by Hippocrates, Aristotle, and Pliny; but its organization and mode of development have only been properly understood during the last few years. The segments of which it is composed vary in size, and number from 800 to 1000, the earlier immature ones being extremely narrow, and the sexually mature joints commencing at about the 450th segment. From 10 to 35 ft. may be regarded as representing its ordinary length; its breadth at about the widest part being one-third of an inch. The head, which is seldom seen in the tapeworms exhibited in our museums, although the evacuation of the head with the rest of the worm is not very rare, is very small and globular (about the size of a pin's head), with black pigment ingrained in it. On examining it with a low magnifying power, it displays four circular sucking disks, in front of which is a conical proboscis, armed with a double crown of hooks, from 23 to 28 in each circular row. The head is succeeded by a very narrow neck, nearly half an inch in length, which is continued into the anterior or sexually immature part of the body, in which traces of segmentation first appear in the form of fine transverse lines, which are gradually replaced by visible joints. These joints or segments represent the body, and each mature segment contains both male and female organs of generation; and in addition to these structures, the entire series of joints is traversed by a set of vascular canals constituting the so-called aquiferous system, which consists of two main channels, one passing down on either side of the worm, and both being connected by transverse vessels, which occur singly at one end of every joint. It is only in the alimentary canal of man or some other animal that a tapeworm of any kind can attain to sexual maturity; and in all of these the eggs are fecundated before being discharged. The expulsion of the eggs may take place in any of

the following ways: First, the mature segments separate from each other, and passing out of the body, either with the ordinary evacuation of the bowels or independently, become decomposed, and set free the enclosed eggs. The single joints thus discharged undergo violent contraction after being expelled, which led to their being formerly mistaken for a distinct species of worm, to which the title *vermes cucurbitini* was applied, from their resemblance to a pumpkin seed. There is a figure in Aitken's *Medicine*, 3d ed. vol. i. p. 815, showing the joints of a *tænia mediocanellata* (which will be presently described) of the natural size, in various stages of contraction; and on examining the recently discharged excrement of a constipated dog, the same phenomenon may be very frequently observed. Secondly, the eggs may be discharged through the genital pore by pressure from any cause. It is only thus that we can account for the occasional (but very rare) coexistence of a *cysticercus cellulosa* (the embryo of the worm) and an adult tapeworm in the intestinal canal of the human subject—an association which constitutes one of the most serious dangers which the matured worm can inflict upon its host, and one of the strongest indications for its removal. Thirdly and lastly, the mature joints sometimes appear to undergo disintegration within the intestine, and to liberate the eggs; but the conditions under which this disintegration occurs are unknown. In reference to the ultimate fate of the embryos *in ovo*, that are liberated in the intestinal canal, Dr. Cobbold has informed the author of this article in a private communication, that, in his opinion, they do not migrate in the living host, except when by regurgitation they occasionally get into the stomach, when, after their shells have been dissolved by the gastric juice, the young organisms commence their wanderings. The mature segments are usually expelled from the human bowel at the rate of six or eight a day. Their vitality is prolonged by moisture, which favors the distribution of the liberated eggs over grass and other vegetables, or in water, which may be used as food or drink by animals. For a full description of the eggs we must refer to Dr. Cobbold's work. It is sufficient here to remark that, in their mature condition, they "present a globular figure, and are easily recognized by their remarkably thick shell, which surrounds the six-hooked embryo. They present an average diameter of $\frac{1}{16}$ of an inch, the shell itself measuring about $\frac{1}{100}$ of an inch in thickness. After a while, by accident as it were, a pig coming in the way of these embryos, or of the proglottides, is liable to swallow them along with matters taken in as food. The embryos, immediately on their being transferred to the digestive canal of the pig, escape from the egg-shells, and bore their way through the living tissues of the animal, and having lodged themselves in the fatty part of the flesh, they there rest to await their further transformations or destiny. The animal thus infected becomes measled, its flesh constituting the so-called measly pork. In this situation the embryos drop their hooks, and become transformed into the *cysticercus cellulosa*. A portion of this measled meat being eaten by ourselves, either in a raw or imperfectly cooked condition, transfers the cysticercus to our own alimentary canal, in which locality the cysticercus attaches itself to the wall of the human intestine, and having secured a good anchorage, begins to grow at the lower or caudal extremity, producing numerous joints or buds to form the strobila or tapeworm colony."—Cobbold, *Entozoa*, p. 221. In its fully mature stage the *measle* presents the appearance of an elliptical hydatid, varying in size from that of a pea to that of a small kidney-bean, the average diameter being one-third of an inch. On dissecting or breaking up a measle it will be seen that the great vesicular portion constitutes the bladder-like caudal extremity of the cysticercus, while the head, neck, and body can be drawn out so as to exhibit a vermiform character.

In the article GENERATIONS, ALTERNATION OF, it was stated that the group of phenomena included in that term would be further illustrated in the history of the tapeworm. From what has been already shown it appears that "we have a simple alternation of generation in which the immediate product of the proglottis (or sexually matured zooid individual) is a six-hooked brood; by metamorphosis the latter becomes transformed into the cysticercus, having a head with four suckers, and a double crown of hooks; and by gemmation the latter gives rise to a whole colony (strobila) of individuals, the greater part of which are destined to become sexually mature—zooid individuals or proglottides. It will be observed, therefore, that the product of a single ovum is, in the first instance, a single non-sexual embryo; in the second phase, it becomes a non-sexual cysticercus (these two phases together constituting the protozooid); in the third change it gives off, by budding, numerous gemmules, most of them destined to be sexually mature individuals (or deuterozooids), in this way resembling their original parents. The relation and nature of these developmental changes may be further simplified by placing the various life phases in a tabulated form as follows:

- | | |
|----------------------------------------------------------------------|---------------|
| (a.) Egg in all stages. | } Protozooid. |
| (b.) Six-hooked embryo = proscœlex. | |
| (c.) Resting larvæ, or <i>cysticercus (telæ) cellulosa</i> (scolex). | |
| (d.) Immature tapeworm. | |
| (e.) Strobila, or sexually mature <i>tænia solium</i> . | |
| (f.) Proglottis (cucurbitinus) = free segment = deuterozooid. | |

—Cobbold, *Entozoa*, pp. 221, 222.

How long a tapeworm can naturally exist in an intestinal canal is not known; but there is doubtless a period at which the parasite spontaneously separates from the intes-

tinal mucous membrane of its host—a period probably coinciding with the shedding and non-renewal of the cirlet of hooks. When this separation occurs, the whole length of the worm is expelled, in the same manner as if the parasite had been first killed by the administration of a vermifuge medicine. From this history of the structure and life-history of this organism, which applies with slight difference in minor points to all other tapeworms, we proceed to describe the injurious effects which the worm in its adult and larval stages produces on man, and the precautions which should be taken to prevent its entrance into the system; while the discussion of the means of expelling it when it has once found a lodgment in the intestinal canal, will be postponed to the article on VERMIFUGES.

The common tapeworm may cause disease, and even death, by its aggressions, either in the adult or in the larval stage of its existence. A mature tapeworm in the intestinal canal may give rise to a series of anomalous symptoms, including “vertigo, noises in the ears, impairment of sight, itching of the nose and anus, salivation, dyspepsia and loss of appetite, colic, pains over the epigastrium and in different parts of the abdomen, palpitation, syncope, the sensation of weight in the abdomen, pains and lassitude in the limbs, and emaciation.”—Davaine *Traité des Entozoaires*, etc., p. 103. Many cases are on record in which hysterical fits, chorea, epilepsy, convulsions of various kinds, and even mania, have been induced by the irritation excited by this parasite, and have ceased at once on its removal. But distressing as these symptomatic phenomena may be, their injurious effects are trifling as compared with the troubles which follow the deposition and growth of the larval form within the body, especially when the cysticerci find a home in the more important vital organs. There are at least a hundred cases on record in which the cysticercus has caused death by its development within the human brain. In the present state of our knowledge, it is impossible to diagnose these cases; and even if a correct diagnosis were possible, nothing could be done in the way of treatment. Epilepsy, with or without mania or imbecility, is commonly, but not invariably present in these cases. “Cysticerci,” says Dr. Cobbold, “may develop themselves in almost any situation in the human body, but they occur most frequently in the subcutaneous areolar, and inter-muscular connective tissue; next, most commonly in the brain and eye, and lastly, in the substance of the heart and other viscera of the trunk.”—*Entozoa*, p. 226. The adult form of the worm enters the system as the cysticercus of mealy pork, and to eat raw or underdone mealy pork is an almost certain means of introducing this parasite into the body. It is satisfactory to know that the temperature of boiling water is quite sufficient to destroy the vitality of the measles; and that in ordinary salted pork, and in hams, they are destroyed by the action of the salt in the one case, and of the combined salt and smoke in the other. Sausages, into which it is to be feared mealy pork too often find its way, are rendered safe if they are cooked till no pink, raw-like, fleshy look can be seen in their center. Butchers are especially liable to tapeworm, in consequence of their touching and cutting mealy pork, and then accidentally transferring the cysticercus by the hand, or even by the knife to the mouth, and by indiscriminately using the same knife for various meats, both butchers and cooks may readily disseminate the infection over various articles of food. The larval worm may gain access into the human body by our swallowing the mature eggs of the tapeworm. Those who, as students of this department of natural history, handle fresh tapeworms, are perhaps especially liable to this misfortune; but, says Dr. Cobbold, “our neighbors, who devour choice salads, also run a certain amount of risk, not only as regards this entozoon, but as respects several others. The vegetables may be manured with night-soil containing myriads of tapeworm eggs, or they may be watered with fluid filth into which these eggs have been cast. In such cases, one or more tapeworm ova may be transferred to our digestive organs, unless the vegetables are carefully cleansed before they appear on the table. In the same way, one perceives how fallen fruits, all sorts of edible plants, as well as pond, canal, or even river water, procured from the neighborhood of human habitations, are liable to harbor the embryos capable of gaining an entrance to our bodies. It thus becomes evident also how one individual suffering from tapeworm may infect a whole neighborhood, rendering the swine mealy, these animals in their turn spreading the disease far and wide.” Such a person may also prove dangerous—even fatal to his neighbors directly (without the intervention of a pig), by ejecting mature proglottides, from which thousands of eggs may escape, some of which may readily come in contact with human food or drink, make their way into the stomach, and from thence get into the circulation, and finally to the brain, where they cause convulsions and death. The most remarkable case on record of what may be termed a *mealy man*, is one described, in 1864, by Delore, in the *Gazette Méd. de Paris*, and quoted by Dr. Cobbold. He died at the age of 77, from pulmonary catarrh, old age, and fractured neck of the thigh-bone; and on examining his body after death, no less than 2,000 cysticerci were found, of which 111 occurred in the nervous centers.

The tapeworm that ranks next in importance to the *tania solium* is the *tania medio-canellata*, which was first established as a distinct species by Küchenmeister only a few years ago. It exceeds the *T. solium* both as regards length, breadth, and the thickness of the individual segments; the head is also somewhat larger, abruptly truncated at the crown, destitute of a proboscis and a hook-apparatus—hence this species has been described as the *hookless tapeworm*—but furnished with very large sucking-disks, sur

rounded by much dark pigment, which gives the head a blackish appearance. The specific name of *mediocanellata* has reference to an interesting and almost specific character in connection with the water-vascular system, into which we have not space to enter. Leuckart has proved by experiment that the measles or cysticerci which produced this worm are to be found in the muscles and internal organs of cattle. He administered proglottides of *T. mediocanellata* to three calves, a sheep, and a pig. In the two last-named animals they produced no effect, as was shown by their post-mortem examination; while in the calves they produced a kind of leprosy, which has since been characterized as "acute cestoid tuberculosis," and which proved fatal if too large a dose of eggs was administered. On examining one of these animals after its restoration to health—48 days after the eggs were swallowed—he found numerous cysticercus-vesicles, larger and more opalescent than those of the pig, lodged in the muscles; and as the heads of the contained cysticerci exhibited the distinctive peculiarities presented by the head of the adult worm, "we are supplied with the most unequivocal evidence that man becomes infested with this second form of tapeworm by eating imperfectly cooked veal and beef." Hitherto the two above-described species have commonly been included under *T. solium*, from want of due examination, especially of the head. Dr. Cobbold believes that their respective frequency will ultimately be found pretty well on a par, though probably the *T. solium* will maintain a slight ascendancy, in consequence of the relative cheapness of pork. "Admitting occasional exceptions," he observes, "the hooked worm infests the poor, and the hookless worm the rich. This circumstance accords with the fact, that the lower classes subsist chiefly upon pork, while the wealthier prefer mutton, veal, and roast beef."—*Entozoa*, p. 243. It gives rise to the same symptoms as the *T. solium*.

The next five tapeworms infesting man may be passed over without notice, as being of very rare occurrence. *Tenia acanthotrias* is only known from a single case, in which, in the larval stage, it was found in the muscles of a woman. The last species we shall describe, the *T. echinococcus*, is, in its larval condition, probably more fatally injurious to the human race than all the other species of entozoa put together. In its mature (strobila) condition, in which it is found only in the dog and wolf, it seldom exceeds the fourth of an inch in length, and develops only four segments, including that of the head. The final segment, when sexually mature, equals in length the three anterior ones, and contains as many as 5,000 eggs. The proscœlex or embryo forms large proliferous vesicles, in which the scolices or larvæ (known also as acephalocysts, echinococci, echinococcus heads or vesicles, pillbox hydatids, etc.) are developed by gemmation internally. The eggs develop in their interior a six-hooked embryo, and these embryos are introduced into our bodies with food or water into which the eggs have been carried. "With an especial liking for the liver," says Dr. Cobbold, "they bore their way into this organ, or are carried along the circulating current to other organs. In these situations they sooner or later become transformed into simple vesicular, bladder-like bodies, commonly called acephalocysts or hydatids." Instead, however, of displaying the head, neck, and body of a cysticercus, the vesicle retains a globular figure. Its growth is slow, and many months elapse before echinococci are developed within our bodies, after we have swallowed the proper tapeworm eggs and their contained embryos. There have been great differences of opinion among physiologists as to the mode of development of these echinococci; but the following is probably the current view: The inner surface of the vesicle presents after a time slight papillæ or prominences, which, as they enlarge and become oval, are eventually scoleciform, and contain a cavity filled with a limpid fluid. This scolex-like development produces in its interior a brood of scolices or echinococcus heads, or, in other words, becomes gradually transformed into the so-called "brood-capsules" of helminthologists. It is almost impossible to explain the nature of these brood-capsules, with young echinococci in their interior, without the aid of such diagrams and illustrations as are given by Cobbold in his chapter on *T. echinococcus*. In the fully developed state the echinococci vary from $\frac{1}{80}$ to $\frac{1}{100}$ of an inch in diameter. The rostellum supports a double curve of hooks, those in the smaller row varying in size from $\frac{1}{140}$ to $\frac{1}{175}$ of an inch, while those of the larger series are from $\frac{1}{80}$ to $\frac{1}{175}$ of an inch. Below the hooks are four suckers, and the general appearance of the body is finely granulated, from its containing calcareous particles. It often happens that the discovery under the microscope of a few of these little hooks at once decides the nature of an otherwise mysterious tumor. Of 373 cases of the parasite occurring in man, collected by Davaine (who devotes more than one-third of his *Traité des Entozoaires* to this subject, 165 affected the liver, 40 the lungs, 30 the kidneys, 20 the brain, and 17 the bones, while the remainder were spread over other parts; and of 136 cases collected by Cobbold, 51 affected the liver. No less than 35 of these 51 cases recovered. "Four of them were complete natural cases; two others being also temporarily cured in the same. All the rest were cured by surgical operations." It is impossible to state with accuracy the degree of prevalence of hydatids in this country, or the extent to which it proves fatal. In Iceland this disease is endemic to such a degree that about one-sixth of the population are affected with it. It produces a long illness, terminating with a painful death, and no means of cure have yet been discovered. Its prevalence in that island may be rationally accounted for. Firstly, every peasant has, on an average, six dogs, all of which are probably infested by the

mature tapeworm; and secondly, there being only six legally authorized medical men, the great majority of the population (over 10,000 persons, scattered over 1500 sq. m.) are in the hands of quacks, whose principal treatment consists in the administration of fresh dog-excrement. Our authority for this astounding specimen of homeopathic treatment is Leuckart, whose admirable popular essay, *On the Newest Discoveries regarding Human Intestinal Worms, and their Importance in Relation to Hygiene*, in the *Conversations Jahrbuch* (1863), is deserving of the most careful study. For an excellent abstract of the remarkable series of experiments—extending from 1851 to the present day—by which the relationship between the so-called cystic worms and the cestoid worms was established, we may refer the reader to Aitken's *Science and Practice of Medicine*, vol. i.; while for the subject of tapeworm generally, the highest authorities are the works of Küchenmeister and Siebold, translated by the Sydenham society; Davaine's *Traité des Entozoaires*; Weinland's *Essay on the Tapeworms of Man*; Lueckart's *Das Menschlichen Parasiten* (Leipzig, 1863-76); and Cobbold's *Entozoa* (1864), a work equally remarkable for the vast amount of original research which it contains, and for the beauty and correctness of the illustrations.

Tapeworms, although rare among horses and cattle, are common in dogs and sheep, causing irritability of the bowels, and an unthrifty appearance. For dogs no remedy answers so well as powdered areca nut, of which 30 grains suffice for a dog weighing about 20 lbs. It is best given after 10 or 12 hours' fasting, in a little soup or milk, and should be followed in a few hours by a dose of castor oil. Neither areca nor any of the approved remedies used in men, prove effectual in sheep; and one of the best prescriptions for them consists of 40 drops of oil of turpentine, a dram of powdered green vitriol, and an ounce of common salt, given mixed in a little milk or gruel, or, where their bowels are confined, in linseed oil. A daily allowance of linseed cake and sound dry food should likewise be given with the grass or roots, and pieces of rock-salt left within the animal's reach. See illus., WORMS, ETC., vol. XV.

TAPIO'CA. See MANIOC and CASSAVA.

TAPIR, *Tapirus*, a genus of *pachydermata*, of the section *ordinaria*; having a bulky form, with moderately long legs; the fore-feet four-toed, the hind-feet three-toed; the skin thick, the hair short; the tail very small; the neck thick; the ears short; the eyes small; the muzzle elongated; the nose prolonged into a short, flexible proboscis, which, however, does not terminate in an organ of touch and prehension, like that of the elephant; 6 incisors, 2 canine teeth, and 14 molars in each jaw, the molars separated from the canine teeth by a wide interval. The best known species is the AMERICAN TAPIR (*T. Americanus*), which is about the size of a small ass, and is common in almost all parts of South America, its range extending as far s. as the strait of Magellan, although it suddenly ceases to be found at the isthmus of Darien. Its color is a uniform deep-brown, but the young are beautifully marked with yellowish fawn-colored stripes and spots. The skin of the neck forms a thick rounded crest on the nape, with a short mane of stiff hair. The tapir inhabits deep recesses of the forest, and delights in plunging and swimming in water. It feeds chiefly on young shoots of trees, fruits, and other vegetable substances, but is ready to swallow almost anything that comes in its way. Pieces of wood, clay, and pebbles are often found in its stomach. It sometimes commits great ravages in cultivated grounds; a large herd of tapirs sallying forth from the forest by night, trampling and devouring all that they find in the fields. The tapir is a very powerful animal, and, protected by its thick hide, forces its way through the forest where almost no other quadruped can. When assailed by the jaguar it seeks to get rid of him by rushing through thick underwood, and if it can reach water is often successful by plunging in and diving. It is inoffensive, never attacking man; but when hard pressed by dogs makes a violent resistance, and inflicts severe bites. It is very easily tamed, and becomes extremely familiar; but its large size makes it a troublesome pet. Its hide is useful, and its flesh is eaten, although rather dry.—The MALAYAN TAPIR (*T. Malayanus* or *Indicus*) is found in Malacca, Sumatra, etc. It is larger than the American tapir, and its proboscis is rather longer in proportion. The neck has no mane. The color is glossy black, except the back, rump, and sides of the belly, which are white. The colors do not pass gradually one into another, but the line of separation is marked, giving the animal a very peculiar appearance. The habits of this species are very similar to those of the American tapir, and it is equally capable of domestication. The young are striped and spotted as in that species.—A third species is found in the mountainous parts of South America.

The remains of tapirs have been found in miocene and subsequent strata. In all about 12 species have been determined. Tapir-like animals are common in eocene beds. Ten species of *paleotherium* (q. v.) have been described. *Lophiodon*, of which 15 species have been observed, differs from *paleotherium* in the structure of the teeth of the lower jaw—and from other peculiarities in the same organs, *coryphodon* (containing three species) has been separated from both genera.

The tapir is a remarkable exception to the generalization deduced from the comparison of the later tertiary mammals with those living in the same districts at the present day, viz., that there is a close correspondence between the fauna of the two periods. The pliocene and post-pliocene bears, hyenas, tigers, elephants, etc., of Europe and Asia

are represented by living species of the same or nearly allied genera. The recent sloths, armadillos, and prehensile-tailed monkeys of South America were preceded by closely related forms in the later tertiary period; as were also the marsupials of Australia. Several species of tapirs have been found in Europe, but they have left no representatives nearer than eastern Asia and South America. See illus., MAMMALIA, vol. IX.

TAPPAN, ARTHUR, 1786-1865; b. Mass.; received a common school education; was clerk in a hardware store in Boston, 1800-7; removed to Montreal, Canada, but after the breaking out of the war (1812) he established himself in New York in the dry-goods importing business in 1814, where he was greatly prospered. He was one of the founders of the American tract society, and gave liberally for its first building; aided in establishing and endowing Lane Theological Seminary (Presbyterian), Cincinnati; founded a professorship in Auburn Seminary; erected Tappan Hall, Oberlin; established with his brother Lewis the *Journal of Commerce*, New York, 1828. A vigorous opponent of slavery, he established at his own expense the *Emancipator*, 1833; originated the New York city anti-slavery society; was appointed president of the American anti-slavery society formed in Philadelphia, contributing to it for some time \$1,000 per month; failed in 1842 and went into bankruptcy, giving up all his personal property. He was afterward connected with the "mercantile agency" established by his brother. He left a high reputation for integrity, earnestness, and benevolence.

TAPPAN, BENJAMIN, 1773-1857, b. Mass.; brother of Arthur and Lewis; at first a copper-plate engraver and printer. After giving considerable attention to portrait-painting he studied law, and was admitted to the bar. In 1803 he was a member of the legislature of Ohio, whither he had removed in 1799. He served in the war of 1812 as an aid-de-camp to Gen. Wadsworth. He was afterward for several years presiding judge of the 5th Ohio circuit. In 1833 he became U. S. district judge for Ohio. He was U. S. senator, 1839-45. He was connected with the democratic party till 1848, when he became a free-soiler. He published in 1831 a volume of *Reports* of cases in the court of common pleas.

TAPPAN, DAVID, D.D., 1752-1803; b. Mass.; graduated at Harvard college, 1771; studied theology two years; became pastor of the Third Church (Congregational), Newbury, Mass.; Hollis professor of divinity in Harvard college, 1792, in which position he remained till his death. He published about 30 sermons and addresses, and after his death appeared *Sermons on Important Subjects*; *Lectures on Jewish Antiquities*.

TAPPAN, HENRY PHILIP, D.D., b. N. Y., 1805; graduated at Union college, 1825; studied theology two years at Auburn seminary; assistant pastor of the Reformed church, Schenectady, N. Y.; pastor of a Congregational church, Pittsfield, Mass., 1823-31; professor of mental and moral philosophy in the university of New York, 1832-38; taught a private school for several years in New York; chancellor of the Michigan university, 1852-63; elected corresponding member of the French Imperial Institution, and president of the American Association for the Advancement of Education. He published *A Step from the New World to the Old*, the results of his inquiry into the working of university education in England and Prussia; *Review of Edward's Inquiry into the Freedom of the Will*; *The Doctrine of Will Determined by an Appeal to Consciousness*; *The Doctrine of the Will Applied to Moral Agency and Responsibility*; *Elements of Logic*; *Illustrations of Personages of the Nineteenth Century*; *Treatise on University Education*. His three works on the will were republished in Glasgow. He d. 1881.

TAPPAN, LEWIS, 1788-1873; brother of Arthur and Benjamin; b. Mass.; was a merchant and cotton manufacturer in Boston; removed to New York in 1827; joined his brother Arthur in establishing the *Journal of Commerce*, of which he was sole proprietor, 1828-31. He took a decided stand against slavery, and for his abolition sentiments and efforts his house was sacked by a mob in 1834; failed in the financial disaster of 1837; established a "mercantile agency." He was active in anti-slavery and benevolent associations; was treasurer and president of the American Missionary Association, founded mainly through his efforts, and one of the early members of Plymouth Church, Brooklyn. He published a *Life of Arthur Tappan*.

TAPPAN BAY, or TAPPAN SEA, reaches from a point about 24 m. n. of New York for a distance of 12 m., being an enlargement of the Hudson river. Its greatest width is 4 m., and it lies between Rockland and Westchester counties, N. Y.

TAPPING is an operation which is most commonly performed on the abdomen, but occasionally on the chest and head. Tapping of the abdomen gives great relief when the abdomen becomes inconveniently distended with fluid contained in the peritoneal sac, or, in the case of the female, in an ovarian cyst. A small incision is then made about 2 in. below the navel, through which the cutting surfaces of the trochar—the instrument used in this operation—are passed. By arrangements, into which we need not enter, the fluid escapes through this instrument. The wound made by the trochar in the abdomen will, in ordinary cases, heal in a few days.

Tapping of the chest is an operation which is occasionally required for the relief of empyema and other effusions in the cavity of the pleura. Tapping of the head has been occasionally found successful in hydrocephalus. Tapping of the pericardium has been

practiced in cases of pericardial dropsy, but it is an operation not to be recommended under any circumstances.

TAPTI, a river of the British presidency of Bombay, India, rises in the Saugur and Nerbuddah territories, in lat. about $21^{\circ} 46'$ n., flows w. through Scindhia's dominions and the districts of Candesh and Surat to its mouth in the gulf of Cambay, 17 m. below the town of Surat. It is 457 m. in length; but can hardly be said to be navigable, for even small vessels of from 40 to 50 tons burden cannot ascend higher than Surat.

TAR is a complex, strong-smelling, dark-colored substance of oily consistency obtained in the destructive distillation of peat, wood, coal, bones, and other organic substances. Its composition varies, depending upon its source and the conditions of its manufacture. Wood-tar is often the chief object of the process that yields it, but the other tars are by-products, obtained in industries carried on primarily for other purposes. Peat-tar is produced in the manufacture of illuminating gas or charcoal from peat; coal-tar comes from the gas or coke furnaces; while bone-tar has its source in the bone-black industry. The tar from bones is especially rich in compounds containing nitrogen, while wood-tar contains least of the ammonia and other nitrogenous constituents, but most, in comparison with other tars, of oxidized products like acetic acid and wood alcohol.

BONE-TAR, the least in commercial importance, is a rank-smelling liquid known as Dippel's oil, used chiefly for lubricating purposes. A number of pure substances have been isolated from it, among them the pyridin bases—pyridin (C_5H_5N), picolin (C_6H_7N), lutidin (C_7H_9N).

WOOD-TAR, when made as a by-product in the manufacture of gas from wood, is collected much like coal-tar. But it is commonly made from the resinous roots and wood of various pines in Scotland, in the north of Europe, and largely in South Carolina and Georgia. The wood is heaped into a conical stack upon a surface depressed at the centre, covered with earth and fired. The tar runs to the centre, from which a drain pipe conveys it to receptacles outside. This process causes the waste of the illuminating gases, much of the wood-naphtha and pyroligneous (or acetic) acid; so that the process is economically conducted in retorts with reference to saving all the products, the illuminating gas being used as fuel to heat the retorts. This tar is largely used for water-proofing, preservative, and antiseptic purposes, and for the manufacture of some black pigments. Among the compounds which have been separated from it are the solids, paraffine ($C_{25}H_{52}$), naphthalene ($C_{10}H_8$), cedricet ($C_{16}H_{16}O_6$), pyrene ($C_{16}H_{10}$), chrysene ($C_{18}H_{12}$); and the liquids, toluene (C_7H_8), xylene (C_8H_{10}), cymene ($C_{10}H_{14}$), creosote, a mixture, acetic acid ($C_2H_4O_2$), and wood naphtha (CH_4O). Wood-tar, under the name of *Pix liquida*, has place in the Pharmacopœias, U. S. and Br., and in doses of one or two grains is looked on with perhaps increasing favor as a remedy in diseases of the mucous membrane of the respiratory passages. Bishop Berkeley's commendatory essay on the use of tar-water in diseases of the chest and kidneys is often quoted (see Chambers' *Book of Days*, vol. i., p. 108).

COAL-TAR has come into great commercial importance within a few years, and an indefinite number of useful compounds are made from it. The products of distillation of coal may be briefly divided into four groups—the volatile products used after purification for illumination; the products dissolved by water, consisting chiefly of compounds of ammonia; the insoluble products condensed in water constituting the *tar*, and the coke and gas carbon remaining in the retorts. The vapors from the hot retorts are led directly into a large pipe carrying water—the hydraulic main—and here the tar condenses to a liquid and is conducted to a reservoir. It is afterwards subjected to distillation in iron retorts, with gradually increasing heat, and separated into fractions of different boiling points. It is out of the question in small space to give all the fractions, or even allude to the different methods employed; but the following, partly from Roscoe, will give a general idea of the processes and products:

The *first burnings* amount to about 2 to 4 per cent. of the tar and contain carbon disulphide, paraffines, benzine, etc., and some ammonia water. The receiver is changed at 110° C. The next product is the *light oil* or *crude naphtha* containing benzine (C_6H_6), toluene (C_7H_8), xylene (C_8H_{10}) and similar compounds of higher boiling point, and constituting 7 to 8 per cent. of the tar. The light oil floats on water and comes over between 110° and 210° C., though in some works a middle oil is taken between 170° and 230° C. From 210° to 400° C. comes the *heavy* or *dead oil* (which sinks in water), some 25 per cent. of the tar. The dead oil contains carbolic acid (phenol, C_6H_5O), naphthaline ($C_{10}H_8$), anthracene ($C_{14}H_{10}$), anilin (C_6H_7N). And there is left in the retort a black substance, becoming brittle on cooling—the *pitch*.

These various fractions are further split by subsequent distillation with reference to commercial demands. The light oil is distilled to secure in the distillate all the benzine; the product, which contains much of the toluene also, is used in the manufacture of anilin dyes. The dead oil may be separated into *carbolic oil*, *creosote oil*, and *anthracene oil*. The carbolic oil is used for the manufacture of carbolic acid and naphthaline, the latter being a solid used in the manufacture of dyes. The creosote oil is used also for naphthaline, or, entire, for preservative purposes. From the anthracene oil is obtained the valuable solid anthracene used in the manufacture of alizarin dyes. The pitch is

used for pavements, acid-proof varnishes, and lamp-black. In order to soften it, it is melted with the residues from the carbolic and creosote oils. These are but a few of the constantly increasing uses of the coal-tar products. Within a few years many medicines and antiseptics have been prepared from it, such as saccharin, acetanilid, antipyrin, pyrrrol, cresol. Its greatest application, however, is in the manufacture of a great variety of brilliant dyes.

TARA, or **TARO**, *Colocasia macrorrhiza*, a plant of the natural order *aracea*, of the same genus with the coco (q.v.), or eddoes, and cultivated for its roots, which are a principal article of food in the South Sea Islands. The roots are 12 to 16 in. long, and as much in girth. They are washed to take away their acidity, which is such as to cause excoriation of the mouth and palate. They are cooked in the same way as bread-fruit, the rind being first scraped off. A pleasant flour is made of tara.

TARA FERN, *Pteris esculenta*, a species of brake (q.v.), the root (rhizome) of which was one of the principal articles of food of the New Zealanders, before the settlement of New Zealand by British colonists. This fern comes to perfection only in good soils, and there the plant is ten ft. high. Plants three years old furnish the best roots, which are about an inch in circumference. The root, being dug up, is cut in pieces about 9 in. long, and placed in stacks, carefully protected from rain.

TARANTELLA, an Italian dance, deriving its name from Taranto. It is written in 6-8 time, constantly increasing in speed, and alternating in the major and minor. The dancing of the Tarantella was thought to be a remedy for curing a strange kind of insanity, the effects of the bite of the *Lycosa tarantula*, the largest of European spiders. A disease called Tarantism prevailed in Italy during the 15th, 16th, and 17th centuries, but it is not certain that it was caused by the bite of the spider. Bands of musicians traveled throughout the country to play the music, which was the only effective medicine. Few of the songs used to cure Tarantism exist. Jones's *Maltese Melodies* (London, 1805); Stafford Smith's *Musica Antiqua* (1812), and Mendel's *Lexicon* contain a few specimens. Many modern composers have written Tarantellas which bear little resemblance in rhythm and style to the early melodies. Among the most noted are by Thalberg and Heller, for the pianoforte, and a vocal Tarantella, *La Danza*, by Rossini. Auber has introduced it into *La Muette di Portici*, and Mendelssohn in his *Italian Symphony*. See N. Perotto, *Cornocopia* (Venice, 1480); A. Kircher, *Magnes* (Rome, 1641); Hermann Grube, *De Ictu Tarantulae* (Frankfort, 1679); Serao, *Della Tarantella* (Rome, 1742); Vergari, *Tarantismo* (Naples, 1839); and Engel, *Musical Myths* (London, 1879).

TARANTISM may be defined a leaping or dancing mania, originating in, or supposed to originate in, an animal poison. The name is supposed to be derived from the ground-spider, *tarantula* (q.v.), which conveyed the poison into the human body by its bite. The gesticulations, contortions, and cries somewhat resemble those observed in St. Vitus's dance, and other epidemic nervous diseases of the middle ages, with which tarantism was contemporaneous; but the affection differed from these in its origin, in the cachexia present, in the elegance of the movements of the victims, in their partiality for red colors, bright and luminous surfaces, their passion for music, and in their restoration depending upon the use of instrumental or vocal music as a remedy. Although the sufferers were subjected to extraordinary treatment, such as being buried up to the neck in earth, the success of music was so universal and invariable, that a class of tunes, it is said, was composed, called *tarentella*, to be employed in the cure of the tarantati. These have lingered long after the extinction of the malady, and may still be heard in the wilder districts of Italy. While it is highly probable that the physical symptoms were due to the bite of spiders, the mental disturbances and muscular *agitation* should be traced to the secondary effects of these upon the nervous system and imagination. It appeared in various parts of Italy, but was most prevalent in Apulia, where the insects abound. No age or class appears to have been exempt, for we read of a philosophic bishop who allowed himself to be bitten by a tarantula, dancing, etc., as fast and furiously as the peasantry.

TARANTO (anc. *Tarentum*), a town of s. Italy, in the province of Lecce, is situated on a rocky islet, formerly an isthmus, between the Mare Piccolo (Little Sea), an extensive harbor on the e. or landward side of the town, and the Mare Grande (Great Sea), or gulf of Taranto, on the west. The harbor is one of the finest in the country, the entrance being between Cape San Vito and the island of San Pietro. The largest vessels can enter safely. The principal buildings are a cathedral, dedicated to St. Cataldo, a native of Raphoe in Ireland, who was first bishop of Taranto; a fine episcopal palace; a castle and fortifications, erected by Charles V., and commanding both seas; and two hospitals. The streets are as narrow and dark as those of an oriental city. Taranto has manufactures of velvets, linens, and cottons, but little commerce. The Mare Piccolo, however, is still famous (as of yore) for its immense abundance of shell-fish, and a considerable portion of the population derives its subsistence from the oyster and mussel fisheries. Pop. '81, 33,942; according to later estimates about 40,000.

Ancient Tarentum, however, was a far more famous and splendid city than its modern representative. Founded by a body of Spartan emigrants about 708 B.C., it grew and prospered for centuries in happy obscurity. Its territory was not perhaps very fertile, but its pasturage was of the finest, and its olive groves were unsurpassed. Yet it

was not these things that ultimately made it the sovereign city of Magna Græcia; this rank it attained through the supreme excellence of its harbor (the Mare Piccolo), ample and secure beyond all the other harbors of lower Italy. Gradually it became the chief emporium of the Græco-Italian trade, and long after all the rest of the colonial cities in Magna Græcia had fallen into decay, Tarentum was "blooming alone" in undiminished prosperity. We may pass over its earlier history, noticing only the fact, that in the 4th c. B.C., it had for its *strategos*, or general (seven times), the philosopher and geometer Archytas, under whom it became the headquarters of the Pythagorean sect, and was honored with a visit from Plato, who was the guest of Archytas during his residence there. But while in the very acmé of its greatness, it provoked a quarrel with Rome (q.v.), 281 B.C., in which, though aided by the gallantry of Pyrrhus (q.v.), king of Epirus, it was utterly crushed, after a struggle of less than ten years; and though its natural advantages hindered it from sinking into such absolute insignificance as other cities of Magna Græcia, it was never after a place of great importance. Under the empire it was quite overshadowed by Brundisium on the Adriatic, but rose again during the Gothic wars, and passed into the hands of the Saracens and Greeks, from the latter of whom it was wrested by Robert Guiscard, the Norman, in 1063. Since then, it has shared the fortunes of the kingdom of Naples. Few relics of the classic Tarentum are extant, the chief being bits of an amphitheater, a circus, and traces of some of the temples.

TARAN'TULA, *Lycosa tarantula*, a species of spider, of a genus to which the name wolf-spider is often given, a native of the s. of Europe. It derives its name from the city of Taranto, in Italy, where it is very plentiful. It is one of the largest of European spiders, of a somewhat elongated shape, with rather long legs. It is one of those spiders which seek their prey by hunting. Its bite is much dreaded, and has been supposed to cause the disease called *tarantism* (q.v.).—Several species of spider nearly allied to the tarantula are found in different parts of the s. of Europe. One of them (*lycosa narbonensis*) frequents dry uncultivated grounds in the s. of France, and makes a little pit in the ground, near the entrance of which it sits watching for prey. The prey is carried into the pit to be devoured. A spider called tarantula is common in Texas.

TARARE, a thriving and important manufacturing t. of France, in the dep. of Rhône, stands at the foot of mount Tarare, one of the highest summits of the Beaujolais range, 22 m. n.w. of Lyons. Formerly unimportant, it is now a rich and flourishing town, the inhabitants of which are engaged in the manufacture of muslins, cloth, silk, and merino fabrics, and in embroidering and bleaching. The muslins of Tarare are famous for their fineness. See TARLATAN. Pop. '91, 11,783.

TARASCON, a t. of France, in the dep. of Bouches-du-Rhône, 8 m. n. of Arles. The church of St. Martha dates from the year 1187, and is so called after Martha, the sister of Lazarus, and the patron saint of the town. Woolen and silk fabrics, and brandy and vinegar, are manufactured. The town acquired considerable note, and of a sort that was displeasing to its inhabitants, it is said, by Daudet's well-known *Tartarin de Tarascon*. Pop. '91, 6597.

TARAX'ACUM, or dandelion (q.v.) root, is employed to a considerable extent in medicine. The roots should be gathered in August and September, when the juice is most abundant. There is no very satisfactory analysis of this juice, but it is said to contain mannite, resin, sugar, gum, caoutchouc, and a crystallizable matter termed *taraxicine*, on which its active properties probably depend. This medicine may be prescribed with advantage in the form of extract, decoction, or juice in chronic diseases of the liver, and in certain forms of dyspepsia and skin-disease which are accompanied by derangement of the biliary organs. In very large doses, it has a diuretic and slightly aperient action.

TARAZO'NA, a t. of Spain, in the province of Saragossa, 43 m. n.w. of the city of that name, on the Queyles, a tributary of the Ebro. It stands on a wind-blown plain, exposed to bleak winds from the Sierra de Moncayo on the s., and from the Pyrenees on the north. It contains a cathedral with a slender brick spire and rich interior, a bishop's palace, and a Moorish *Alcazar*. Pop. '87, 8538, mainly engaged in agriculture.

Tarazona is the ancient *Turiaso*; and here a few Roman troops routed a Celtiberian army. It became a municipium under the Romans; and under the Goths, by whom it was fostered, it became famous for its steel.

TARBAGATAI', a military frontier district of Chinese Turkestan; also the name of a range of mountains forming the boundary line between this district and the Russian province of Semipolatsk. Area of the district, about 25,500 sq.m.; pop. about 64,000. The population is largely nomadic. The mountains reach a height of about 10,000 ft.

TARBES, a t. in the s. of France, capital of the dep. of Hautes-Pyrénées, stands on the left bank of the Adour, 23 m. e.s.e. of Pau. It is a station on the *Chemin de fer du Midi*, and the center of communication with all parts of the Pyrenees, the lofty line of which bounds the prospect on the south. The modern cathedral and the museum are the principal and indeed the only notable buildings. The manufactures include paper, flax, woollens, and machinery. Tarbes is the seat of an active general trade. Pop. '95, 25,087.

Tarbes dates from the time of the Romans, and its bishopric was founded in the year 420.

TARDIGRADA. See SLOTH.

TARE, *Ervum*, a genus of plants of the natural order *leguminosæ*, sub-order *papilionaceæ*, distinguished from *vicia* (see VETCH), to which it is nearly allied, by a capitate stigma, downy all over. It contains only a few species of weak climbing plants, natives of the temperate parts of the Eastern Hemisphere. One of these is the LENTIL (q.v.).—Two (*E. hirsutum* and *E. tetraspermum*), generally known by the name of TARE, are common in cornfields and hedges in Britain. They have very small flowers and pods; the leaves are pinnate, and the leaflets small. They afford nourishing food for cattle, but the quantity is so small that they are not worthy of cultivation, and are chiefly known as a nuisance in cornfields. A species of tare (*E. sativum*), with an upright branching habit, is cultivated in some parts of Europe for its herbage, which is used for feeding cattle. The bulk of herbage is small, but its nutritious character is thought to compensate for this. The leaves have from 8 to 14 pair of leaflets. The plant thrives well in poor sandy soils.—It is not supposed that the tare of the New Testament has any affinity to these plants: it is doubtful what it is, but it appears not improbable that it is the DARNEL (q.v.).

TARE AND TRET, certain deductions usually made from the gross weight of goods. *Tare* is the weight of the box, cask, bag, or wrapping in which the goods are contained; and the amount is obtained either by weighing the empty package itself, by taking an average of a few similar packages of equal size, or by mutually agreeing upon a certain proportion of the gross weight. The remainder, after deducting the tare, is the *net weight*. Another deduction, at the rate of 4 lbs. for every 104 lbs., or $\frac{1}{26}$ of the net weight, is then made, as an allowance for waste through dust, etc., and is called *tret*. Some other allowances of minute magnitude as draft, cloff, etc., are occasionally made after tret, but they are falling into disuse.

TARGET (root uncertain, but the word, in some form, found in all European languages), in its modern sense, is the mark for aiming at in practicing with the cannon, rifle, or bow and arrow. In its more ancient meaning, a target or targe was a shield, circular in form, cut out of ox-hide, mounted on light but strong wood, and strengthened by bosses, spikes, etc. Of modern targets, the simplest is that used for archery (q.v.). With regard to rifle targets, the spread of the volunteer movement and the numerous rifle-matches have caused ranges to be constructed over the whole country. The necessities are: a butt, artificially constructed or cut in the face of a hill, to prevent wide balls from scattering—a marker's shot-proof cell, near the targets—and a range of such length as can be procured. The sizes of targets used by the British army are as follows: for firing up to 300 yards, the target is 6 ft. high by 4 ft. broad, with a circular bull's eye 1 foot in diameter, and a center of 3 feet. Up to 600 yards, the target is 6 ft. square; bull's eye, 2 ft. diameter; center, 4 feet. Up to 800 yards, the target is 6 ft. by 8; bull's eye, 3 ft. in diameter; and center, 5 feet. The marker signals the "hits" from his box, denoting a bull's-eye by a red-and-white flag, a center by a blue flag, and an outer by a white flag. If he show a red flag, it is to cease firing while he inspects the target. In scoring, the outer counts 2; center, 3; and bull's-eye, 4. A red flag should fly on the butt during the whole time of practice, to warn passers-by to keep off the range. The targets used by the National Rifle Association at Wimbledon are not the same as those used by the army. According to the Wimbledon regulations of 1876, the target for the distance of 200 yards had a circle of 40 in. diameter, divided into the circular bull's-eye 8 in. in diameter, a center of 16 in. diameter, an "inner" of 28 in., the rest of the 40 in. being accounted "outer." On the target for 500 and 600 yards, the circle of 70 in. falls into a bull's-eye of 22 in. diameter, center 38 in., inner 54 in., and the rest outer. The rectangular frame for 800, 900, and 1000 yards distance had a circular bull's-eye of 3 ft. in diameter, a center 4 ft. 6 in., a square inner of 6 ft., the remainder of the target counting as outer. Of the ordinary Wimbledon targets for successive years, that for 200 yards distance is divided into a bull's-eye 8 in. in diameter; "inner," 1 foot; "magpie," 2 ft.; and outer, the remainder of the target 4 ft. square. At 500 and 600 yards, the bull's-eye is 2 ft. in diameter; the inner, 3 ft.; the magpie, 4 ft.; and outer, the rest of the target of 6 ft. square. At 800, 900, and 1000 yards, the bull's-eye is 3 ft. diameter; inner, 4½ ft.; magpie, 6 ft. square; and outer, the rest of the target of 12 ft. by 6 feet.

Previous to the inaugurating of the Wimbledon meeting in 1860, all targets were circular, and made of iron. From that year till 1873 inclusive, they were square iron plates; but in 1874 targets of canvas stretched on an iron frame were introduced.

TARGOWITZ, or TARGOWICZA, in Russia, a small t. in the government of Kief (q.v.), on the borders of Kherson, was the scene (May, 1792) of a confederation ("plot" as the patriots had it) of the five Polish nobles (Potocki, Branecki, Bzeureski, and two others of little note) who were adverse to the constitution of May 3, 1791. They were incited to this traitorous conduct toward their country by Catharine II., and after their conduct had been fully unveiled, they were declared traitors to their country, and only escaped death by precipitate flight to Russia, where they were munificently rewarded for

the treason which had given the czarina a pretext for executing the second partition of Poland (q.v.).

TARGUM (Chaldee, from *tirgem*, a word of uncertain origin, designating to translate, explain), the general term for the Aramaic versions of the Old Testament, which became necessary when, after and perhaps during the Babylonian exile, Hebrew began to die out as the popular language, and was supplanted by "Chaldee," an idiom, or rather a family of idioms, on which we have spoken under **SHEMITIC LANGUAGES**.

The origin of the Targum itself is shrouded in mystery. The first signs of it—as an already fixed institution—have been found by some in the book of Nehemiah, and according to tradition, Ezra and his coadjutors were its original founders. However this be, there can be no doubt that its beginnings belong to a comparatively early period. The Mishna (q.v.) contains a number of strict injunctions respecting it, and also respecting a certain guild of meturgemans (whence dragoman) or interpreters, who had sprung up as professional followers of those learned men who, at a previous period, had volunteered their services in the translation and paraphrastic interpretation, both activities, as we said, implied by the term. At first, and indeed for many centuries, the Targum was not committed to writing, for the same reason that the "oral law" itself was not at first intended ever to become fixed as a code for all times. In the course of time, however, both had to yield to circumstances, and their being written down was considered preferable to their being utterly forgotten, of which there was no small danger. Yet a small portion only of the immense mass of oral targums that must have been produced, has survived. All that is now extant are three distinct targums on the Pentateuch, a targum on the prophets, targums on the Hagiographa, viz., on Psalms, Job, Proverbs, the five "Megilloth" (Song of Songs, Ruth, Lamentations, Esther, Ecclesiastes), two targums on Esther, one on Chronicles, one on Daniel, and one on the apocryphal pieces of Esther. The most important of the three Pentateuch targums is the one named after Onkelos (q.v.), probably a corruption of Akylas, whose Greek version had become so popular that this Chaldee version was honored with being called after it. In its present shape, this translation dates probably from the end of the 3d or beginning of the 4th c. A.D., although snatches of it were collected and written down more than a hundred years earlier. We have spoken of its language and its general character already under **ONKELOS**, and may here briefly state that it is composed in an Aramaic closely resembling that of Daniel, and that it is as excellent a translation "for the people," which it meant to be, as can well be conceived. Occasionally, when the subject imperatively demands it, it introduces some paraphrastic by-work, and it only deviates from the text where the divine dignity would have appeared to suffer in the eyes of the multitude by a literal interpretation. Its value for exegetical purposes is no less great than it would be for linguistic and antiquarian purposes, were it more explored with that view than has been the case as yet.

The two other Targums on the Pentateuch, hitherto known as Targum Jonathan ben Uzziel, and Targum Jerushalmi, are merely recensions of one and the same version—the name of the first recension being merely a perpetuated error of a single scribe—which owes its origin to Palestine or Syria (Onkelos being of Babylonian origin), and cannot well have been redacted before the 7th c. A.D. There is no doubt that originally this "Jerusalem Targum" embraced the whole of the Old Testament, as did the Babylonian; but nothing has survived beyond these two recensions of the Pentateuch, the first complete, the second in a fragmentary condition: the former probably intended as an emendation of Onkelos, chiefly in the direction of homiletic paraphrase and legendary lore, and the latter as a further emended emendation of single portions. As a version, this Targum is of small importance; but it is invaluable as a storehouse of allegories, parables, sagas, and the like popular poetry of its time. Its language and grammar are exceedingly corrupt; it abounds, moreover, with foreign—Greek, Latin, Persian, and Arabic—terms; and its general use lies more in the direction of Jewish literature itself, as well as of archaeology and antiquities of the early Christian centuries, than in that of a direct interpretation of the Bible text itself. The Targum on the prophets is generally and erroneously ascribed to Jonathan ben Uzziel, an eminent master of the law at the time of Hillel the elder; the fact being that, except one spurious Talmudical passage, in which mention is made of his having translated the Prophets, this Targum is everywhere else, from the Talmud down to the authorities of the 10th c. A.D., ascribed to one R. Joseph, president of a Babylonian academy in the 4th century. And it would indeed seem as if this statement was completely in accordance with the real facts—if not the writing, but the collection and final redaction of this Targum is ascribed to him. Respecting the nature of this version, it may be said that, while being tolerably literal in the first—historical—books, it gradually becomes a mere frame-work of Midrash (q.v.) or Haggada, which it introduces at every turn and at great lengths. It further contains historical bits, disguised, or rather typified, and some lyrical pieces of rare poetical value. In language and general manner, it resembles Onkelos, with which it is of one growth, place, and date, and of which it forms only a kind of continuation.

To the same Joseph "the Blind" to whom the redaction of the foregoing Targum is probably due, is further ascribed a Targum on the Hagiographa. But between him

and the Hagiographical Targums lie, at the least, 600 years; their date being approximately given as about 1000 A.D. Certain distinctions between the different books must further be made. The Targums on Psalms, Job, and Proverbs were probably contemporaneous compositions due to Syria. The two former are made more paraphrastic than the last, which resembles closely the Syriac version. The paraphrase on the five "Megilloth"—a very late production indeed—is principally a collection of more or less poetical fancies, traditions, and legends, to which the single verse in hand merely seems to furnish the key-note. There is, we need not add, but very little to be found in them of what originally must have formed the Targum on these books; nor is there the slightest hint to be found as to who was the real author or editor of their present form. That it was one man's work, is probable enough, from a certain unity of design and style noticeable in all of them. Their dialect lies somewhat between the e. and w. Aramaic. The Targum on the book of Chronicles—almost unknown until the 17th c.—also belongs to a late period, and was probably composed in Palestine. There are some useful philological, historical, and chiefly geographical hints to be gleaned from it, but nothing more; least of all can it be used exegetically. A Persian version of a Targum on Daniel (unedited) is all that has been discovered on that book as yet. It was probably composed in the 12th c., the influence of the early Crusades being plainly visible in it. On the paraphrase of the apocryphal pieces of Esther, we shall not dwell here, any more than on the scanty fragments of a "Palestinian Targum" that are found either interspersed in the general (Babylonian) Targum, or as independent pieces. It seems probable that more of this Palestinian version will come to light some day, as authorities of a few centuries back still quote from it rather largely. At present, however, their quotations are nearly all that remains.

Very little—we might say, next to nothing—has been done as yet to utilize this most important branch of Aramaic literature; in fact, not even an attempt at anything like a critical edition has been made, although it would be difficult to find a more corrupt text than that offered by the MSS. and single printed portions. Some parts have been done into Latin, English, German, etc. The ed. pr. of Onkelos is dated Bologna, 1482; that of the Targum on the Prophets, Leiria, 1494.

TARIFA, a seaport t. of Spain, in the province of Cadiz. It is the most southern town of Europe, is surrounded by tower-embattled walls, and communicates by a causeway with a small island, on which stand a fortress and light-house. The town is the most thoroughly Moorish in Andalusia; it is quadrangular in shape, and its streets are narrow and dark. Tunny and anchovy fisheries are actively carried on. Pop. '87, 13,206.

Tarifa, the Carthaginian *Josa*, and the Roman *Julia Traducta*, received its present name from the Moors, who are said to have called it after Tarif (=Tarik?) ibn Malik, who landed there to reconnoiter previous to the conquest of the country. See MUZA; RODERIC. It was successfully defended in 1812 by 2,500 troops (mostly British) against a French force of 10,000 men, under Victor and Laval.

TARIFF, in the United States, is a word oftenest used to denote the schedule of duties or imposts levied by act of Congress upon goods brought into the country from abroad. The traditional explanation of the origin of the word is that which identifies it with the name of the town Tarifa in Spain, which was itself called after the Berber chief Tarif ibn Malik. Here while the Moors held Spain, all vessels passing through the Straits of Gibraltar, at the narrowest part of which the town was situated, were compelled to stop and pay such duties as were imposed by the lords of the place. Hence the term *tariff* passed into the languages of different European peoples.

A tariff may be levied upon foreign goods for any one of three purposes: (1) simply as a means of augmenting the revenues of a government, in which case it is only one of the various forms of taxation (see TAX); or, (2) as a means of retaliating upon foreign governments for similar restrictions imposed by them, in which case it becomes, as M. de Laveleye says, an instrument of warfare serving a temporary purpose and designed in the end to secure commercial reciprocity (q.v.); or, (3) as a means of fostering artificially, particular industries by protecting them wholly or in part against foreign competition. These three forms of tariff and tariff-legislation will be discussed in detail in a subsequent portion of this article.

GENERAL HISTORY OF TARIFF LEGISLATION. A tariff for the purpose of revenue seems to have been usual among many of the civilized nations of antiquity. In the regal period of Jewish history transit duties were imposed upon foreign goods; and a tax upon foreign merchandise was one of the numerous sources of income that the public treasury possessed. Among the Greeks, especially the Athenian Greeks, a tariff was regularly resorted to as a means of revenue. This tariff was laid upon both exports and imports, and an additional tax was collected from vessels engaged in foreign traffic, for the use of the harbors in which they anchored. The regular export and import duty at Athens was two per cent., though in time of war, when the state was in pressing need of large sums of money, this tax was often considerably augmented. Thus, during the Peloponnesian War, a duty of five per cent. was collected upon all the imports and exports of the states subject to Athens; while Alcibiades collected a tariff of ten per cent. from the vessels that passed in and out of the Euxine Sea, a fortified custom-house being established at Chrysopolis (B.C. 410). This tax was known as *dekate*, and the custom-house *dekateutèrion*.

Import and export duties were also regularly levied by the Roman state, and for the same general purpose as that which led to their imposition in Greece. The name for this tax used by the Latin writers is *portorium*, a name applied likewise to transit duties and bridge tolls. The Roman *portorium* dates back to very early times, for we read in Livy (II.9) that Valerius Publicola exempted the plebeians from the tax at the time when Rome was threatened with an invasion by Porsena, which must have been earlier than B.C. 500. Velleius Paterculus says that Caius Gracchus greatly increased the list of dutiable articles, as did also the censors, M. Æmilius Lepidus and M. Fulvius Nobilior. In the provinces as well as in newly conquered countries, duties were likewise collected by Roman officials known as *portitores* and *publicani*, and the sums were transmitted to the Roman treasury. In some cases, however, the central government, as a particular favor, allowed the subject state to make its own customs laws, stipulating only that Roman citizens should be exempted from paying them. In B.C. 60 all *portoria* were abolished by the Lex Cæcilia so far as concerned the ports of Italy; but Julius Cæsar soon after restored them. Augustus Cæsar still further increased the number of dutiable commodities, and a long list of those that under the later emperors were subject to the payment of a duty is given in the Digest of Justinian. The custom-house officers had the right to search the persons of those arriving from abroad, and smuggling appears to have flourished in ancient as in modern times. Goods "declared" by the traveler to the custom-house officers were known as *scripta*, and those not so declared were styled *in-scripta*. The latter, if found, were liable to confiscation. The rate of duty at Rome seems generally to have been five per cent., but under the later emperors the very large duty of 12½ per cent. (*octava*) is mentioned as the ordinary tax on imports.

After Rome and Roman territory were overrun by the barbarians, the latter gradually adopted the notions of public policy, including the theory of finance, that had prevailed in the fallen state. In the Dark Ages, the feudal lords individually claimed and exercised the right of imposing transit duties levied on all goods that passed by or through his possessions. Hence, says a recent writer, "the rivers and high-roads were fairly lined with custom-houses and toll-gates." When feudalism gave way to monarchy and a strong central government, the kings merely transferred to themselves the rights that had previously been exercised by the barons. They, too, set custom-houses at all their frontiers, and even on the boundaries of their own different provinces. So universal did these duties, local and national, become, that every continental nation was covered with a net-work of customs lines. Various cities also had their local customs-duties, of which the *octroi* collected at Paris to-day is a survival.

In England we first hear of a tariff for revenue under King Ethelred in or about the year 980. At that time, duties on ships and goods were levied and ordered to be paid at Billingsgate, London. They were first acknowledged as a part of the king's revenue in the reign of Edward I., who received them by regular grant from Parliament, if we accept the assertion of Sir Edward Coke, quoted by Blackstone. But wool, skins, and leather were taxable at the royal pleasure, these being the "hereditary customs" of the crown, known in the law-Latin as *custuma antiqua*. Subsequently under the same king, special duties to be paid by foreign merchants only, were levied (*custuma nova*), being protective in their nature and not merely for revenue. The duty on ordinary goods in this reign was sixpence in the pound, which was raised to one shilling (five per cent.) under Richard II., reduced to sixpence and again raised to eightpence, and finally fixed at the shilling rate, where it remained as late as the ninth year of the reign of William III. (1697). The king also had the right of *prisage*, i.e., of taking from every wine-importing vessel of 20 tuns, two tuns for the royal use. These and other duties were originally granted "for the defense of the realm," and especially for the protection of traffic on the high seas, and were at first given for a fixed period, but to Henry VI., Edward IV., and their successors, for life, until the reign of Charles I. whose unconstitutional levy of these duties without grant of Parliament formed one of the grievances against him. On the restoration of Charles II., the duty was again granted for life, and under William and Mary it was made perpetual and assigned to the payment of the national debt.

In 1663 (under Charles II.), a regular tariff was first established with a book or schedule of rates, which formed the basis of the mode of levying customs-duties for the next century and a half. In 1787 Mr. Pitt proposed the abolition of all the duties then existing, and the substitution of a specific duty on each article, amounting, as nearly as possible, to the aggregate of all the various duties then payable. In fixing the final schedule, it is said that 3000 resolutions were passed by the Houses of Parliament. The act that embodied the results was known as the Consolidation Act. A second important consolidation took place in 1825, when 450 statutes on the subject of the tariff were consolidated and compressed into eleven.

In 1846 an entire revolution took place in England's commercial system, signalized by the abolition of the Corn Laws (q.v.). From that date begins the sway of unrestricted trade in England, one duty after another being abolished, and those that remained being lowered, until in 1891-2, her tariff imposed duties for revenue alone, and that upon less than twenty articles. On the continent of Europe the history of tariff legislation has been somewhat more varied. Restrictions upon freedom of commerce were greater and more oppressive than in England, owing to the much longer

survival of feudal tenures and feudal customs, with the concomitant multiplicity of petty sovereignties, each with his own custom-houses and tariff. In France, at one time, every county had its tolls and import taxes, but these internal restrictions upon trade were swept away at the time of the Revolution. The policy of the country with regard to imports from abroad, however, has varied. Napoleon III., by reason of his English associates, was in theory a free-trader; but France has never fully adopted the free-trade doctrine as held in England. In Germany, the great number of local imposts were gradually abolished by the Zollverein (q.v.), which was established in 1833 by the adhesion of Württemberg and Bavaria to the commercial league formed between Prussia and the Hesses, and now comprising not only all German states, but Luxemburg and a small district of Austria south of Kempfen in Bavaria. The policy of the old Zollverein was one of much liberality regarding the taxation of imports, but in 1880, in accordance with the views of Prince Bismarck, a strictly protective system was inaugurated, designed especially to benefit the agricultural interest. Upon Bismarck's fall in 1890, other influences prevailed, and in 1891 the strictness of the protective regulations was relaxed by admitting Austria-Hungary to a partial membership in the commercial union of the German states, and by considering the removal of the prohibitive duties upon foreign grain and other food products.

HISTORY OF TARIFF LEGISLATION IN THE UNITED STATES. The earliest tariff in the history of the United States was that settled by the first national Congress and approved by President Washington, July 4, 1789. It is interesting to note that the preamble of the act establishing it, states that one of its objects is "the encouragement and protection of manufactures," at this early period laying down a principle afterwards adopted as the tenet of a political party. In 1817, at the beginning of President Monroe's administration, Congress abolished the internal taxes that had been made necessary by the cost of the war of 1812; and in his message the President recommended the imposition of a protective tariff pure and simple. A temporary duty had in 1816 been laid upon cottons and woolens, and this, in deference to the desire of the President, was continued for a period of seven years. The rise of the party of Loose Construction (q.v.), headed by Henry Clay, was favorable to the principle of protection, for the Strict Constructionists held that Congress could only impose a tariff for purposes of revenue, and not for the purpose of fostering particular industries. In 1819, a protective tariff bill passed the lower house, but was rejected by the Senate. The election as Speaker, in 1820, of John W. Taylor, of New York, a declared high-tariff man, gave great encouragement to the Eastern manufacturers, and signalized the increasing influence of the protectionists, though in 1822 the Strict Constructionists were able again to defeat bills embodying the protective principle. In 1824, however, the friends of that principle secured a working majority in Congress, and after a prolonged debate adopted a bill whose essential principle was the exclusion from the American market of such foreign goods as competed with those manufactured in this country. This bill divided the members of Congress on sectional lines—the East, being a manufacturing district, voted almost solidly for the bill, while the South, being agricultural, opposed it, and the Southern members violently denounced it as unconstitutional and unjust, as favoring the interests of one section of the country at the expense of the interests of another section.

In 1827, a convention held at Harrisburg, Penn. (July 30), discussed at length the principle of protection. Only four of the slave-states sent delegates. The result of the convention was a petition addressed to Congress praying for an increase of duties on certain articles then manufactured in the United States, a request which the Secretary of the Treasury brought into general notice in his report of the following December. By this time a strong party had been founded to support the protective system, or the "American System," as it was popularly called. The famous "Tariff of 1828," established by Congress after a debate of six weeks, was the immediate result of this party's propaganda. This went further than any act had previously done in the direction of a prohibitive tariff. The chief articles on which protective duties were laid were woolen and cotton fabrics. At that time the value of the cotton goods annually imported from Great Britain was fully \$8,000,000, and that of woolen goods about the same. The exports to Great Britain, on the other hand, of rice, raw cotton, and tobacco (the chief products of the South), reached the sum of \$24,000,000 per annum. The southern producers naturally feared that if the United States should by a high tariff practically prohibit the importation of a large proportion of the British goods, retaliatory measures might lead to a diminution of the southern exports to Great Britain. It was the discontent felt at the South, with the tariff, that led to the famous nullification movement in 1832, in which year Congress, while modifying the act of 1828, distinctly recognized and retained the protective principle. A State Convention held at Columbia, S. C., on November 19, 1832, formally declared the tariffs of 1828 and 1832 to be "null, void, and no law, not binding upon South Carolina, her officers and citizens." The vigorous action of President Jackson in taking strong military measures to meet this movement by force of arms, was supplemented by an act of Congress known as "An Act for the Enforcement of the Tariff," and popularly styled in South Carolina the "Bloody Bill." But before any actual rupture between the state and the general government occurred, the so-called Compromise Tariff, introduced by Henry Clay, was passed

March 3, 1833. It provided for the gradual reduction of the existing tariff until 1842, after which year the duties on all goods were to be 20 per cent. This measure for the time, allayed the excitement in the South; but by the year 1842, it was seen that the financial consequences of the steady reduction of the tariff were extremely serious, since the government revenues had decreased to such an extent as to be less than the expenses. A new tariff was manifestly necessary, and once again the Strict Constructionists joined battle with the Loose Constructionists. The majority in Congress passed a bill which continued the duties imposed by the tariff of 1833, and provided for the division of any surplus revenue among the states. This was vetoed by President Tyler as being a violation of the compromise reached in 1833. A revenue tariff was also vetoed, because it contained the distributing clause, but on its being again passed, with this clause omitted, the President signed it (Aug. 9, 1842). In 1846 a revenue tariff that eliminated altogether the principle of protection was passed, its aim being merely to provide an adequate revenue for the expenses of the government. A still further reduction of duties was made by the tariff of 1857, which fixed them at the lowest figures shown by any tariff since that of 1816.

In 1861, the Republican party being in the ascendancy, a revolution in the financial policy of the government took place, manifested especially by the "Morrill Tariff," passed in that year, which was intended first of all to protect various American manufactures, with the question of revenue wholly a secondary one. Twice in the same year (Aug. 5 and Dec. 24) the duties were still further increased, this time in order to meet the expenses entailed by the civil war.

The exciting problems that were injected into politics by the war and by the conditions resulting from it, relegated purely economic questions to the background for many years. It was not until 1880 that the further consideration of the protective principle again became an important issue. The election of that year in part turned upon the question of the tariff. The Republicans in nominating Gen. Garfield embodied in their platform a strong declaration in favor of maintaining a scale of duties that should continue to protect American industries against foreign competition. The Democrats began to urge the expediency of modifying a tariff that had been framed to meet the conditions of a time of war, and which, as they claimed, was not merely hampering commerce, excluding the United States from the markets of the world, but fostering monopolies by preventing healthful competition. They therefore declared for "a tariff for revenue only," which was afterwards explained as a tariff that should give "incidental protection." The discussion then begun continued with renewed vigor and with a great increase of public interest. In 1882 provision was made by Congress for the appointment of a Commission to report upon the expediency of a reduction of the tariff. This reduction became a question of pressing importance, since the revenues of the government had so far exceeded its expenses as to accumulate in the Treasury a very large and increasing surplus, which, withdrawn from the channels of trade, threatened a serious disturbance of the financial system of the country. In 1882, the Tariff Commission made its report, and in accordance with its recommendations a bill was passed which did not, however, diminish the revenue as much as had been expected. In 1884, the House being democratic, debated the bill known as the "Morrison Horizontal Reduction Bill" for lowering the tariff, but by a combination between the Republicans and the democratic protectionists led by Mr. Randall, of Pennsylvania, it was defeated. The campaign of that year was largely fought out upon the tariff question, for the democratic platform, while evading the question of protection, demanded a real reduction of tariff duties, as well as legislation to check the aggression of great corporations. The election of Mr. Cleveland appeared to show that the cry of "free trade" had ceased to alarm the great body of the voters, but that they were willing to hear argument upon the questions at issue. The new president's message (Dec. 16, 1885) recommended first of all a reduction of the tariff, and in December, 1887, his message was devoted exclusively to this one topic. In it he stated that the surplus in the Treasury was nearly \$140,000,000, demanded as a remedy the immediate abolition of the duties upon wool and upon raw materials in general, and characterized the existing tariff laws as "vicious, inequitable, and illogical." In accordance with the views of this message a new tariff measure, the "Mills Bill," removing the duty on wool, and aiming at an estimated annual reduction of revenue by fully \$50,000,000, passed the House. The Republican Senate offered a substitute repealing the tax upon tobacco and reducing the duty on sugar one-half, thus securing an estimated reduction of \$65,000,000 per annum. Neither bill became law.

The defeat of the Democrats in the presidential election of 1888 was possibly due to the prominence of the tariff question, but as the majority of the popular vote was on their side, it was seen that a reform or, at any rate, a revision of the tariff was sooner or later inevitable. Therefore the Fifty-second Congress took up the matter in earnest, with the result that the famous McKinley Bill, prepared by Major William McKinley (q.v.), of Ohio, passed both houses of Congress and was signed by President Harrison (Sept., 1890). By its provisions the annual reduction of revenue was estimated to be some \$66,000,000, of which \$6,000,000 was due to a reduction of internal revenue taxes, chiefly on tobacco. It also removed the duties on sugars (if not above 16 Dutch standard), on molasses, needles, and on books printed in foreign languages; and reduced

the duty considerably on beads (ornamental), building stone (rough), pocket cutlery, dye-woods, jute, type-metal, lime, matches, cocoa mats, matting, condensed milk, cut nails, oil-cloths, whale oil, paintings by foreign artists, poultry, shoes, and statuary (marble). The bill was essentially, however, a protective bill, and many of the duties of the old tariff were enormously increased, while some articles (such as aluminium, fans, fruits, eggs, macaroni, pepper, plants, railroad ties, telegraph poles, trees for nurseries, cabinet woods, and tin ore) which the old tariff had admitted free were now taxed. The enforcement of the McKinley bill was followed by a very general rise in prices equal to the advance in the duties.

One very important feature of the McKinley bill was the section added through the influence of Mr. James G. Blaine, then Secretary of State, and known as the "reciprocity section." This provided that whenever the President shall be satisfied that the government of any country producing and exporting sugars, molasses, coffee, tea, and hides, or any such articles, imposes duties upon products of the United States which in view of the free introduction of such sugar, molasses, etc., into the United States, he may deem to be reciprocally unequal and unreasonable, he shall have the power to suspend by proclamation the free introduction into the United States of such sugars, etc., from the country in question. The history of this provision and its practical results will be found in the article RECIPROCITY. See also CUSTOMS DUTIES.

On the return of the Democratic party to power in 1893, an effort was made to carry out its promise of tariff reform. A bill framed by Mr. William L. Wilson (q.v.) passed the House, and after much amendment by the Senate became a law without the President's signature, Aug. 27, 1894. It made a considerable reduction in many duties, admitted wool free, and provided for an income tax. It was still in the main, however, a protective measure.

THEORIES OF THE TARIFF. As stated by way of introduction in this article, a tariff may be imposed solely for revenue without any reference to the protection of a home industry, or it may be imposed chiefly with reference to such protection, or it may be imposed simply to force other countries to lower their own duties in order to secure a modification of those imposed by the tariff in question. Absolute free trade (i. e., the abolition of all duties whatsoever) does not exist in any civilized country and probably never will, owing to the financial necessities of all governments, and the fact that a revenue is easily and surely obtainable from customs duties. Even in England, the government raises annually the sum of £20,000,000 from its tax upon imports. Popular usage, therefore, gives the name of "free trade" to that system which imposes a tariff simply to secure an income for the government, and aims not to protect or foster any industries, but regards a protective tariff as an undesirable and injurious interference with the natural laws of trade. As this question has played so important a part in the political and economic history of the United States, and will undoubtedly continue so to do for many years, it seems best to summarize the arguments for and against the two great systems that divide the allegiance of our economists.

PROTECTION. Protection is the name given to that policy which seeks to promote home industries of any kind by the imposition of duties upon the importation of the products of foreign industry; or by paying such bounties and subsidies to those engaged in the home industries as will give them an economic advantage over foreign producers in the home market. A protective policy to a greater or less extent is adopted by nearly all the great nations of the earth, notably by Germany, Russia, and the United States; while the opposite policy of free-trade is put into actual practice only in Great Britain. By nearly all scientific economists, both in Europe and America, however, protection is regarded as a short-sighted and unwise policy. This variance between the opinion of professed students of political economy and the practice of existing governments is a very curious fact, and gives additional interest to the reasons put forward by the advocates of protection to support and justify that policy. These arguments are, in condensed form, as follows:

(1) *The Equilibrium of Classes.* The active members of the state in its relations to industry are divisible into three classes: the agricultural class, the manufacturing class, and the commercial or trading class. Agriculture, with improved methods and by the use of modern implements, produces a surplus of the food products over and above what the producer himself needs. Hence there remains a large portion of the community not needed in the sphere of agriculture. These naturally divide themselves into (a) a manufacturing class, engaged in supplying the community with comforts, conveniences, and luxuries; and (b) a commercial class, to act as the exchangers of products between the agricultural producers on the one hand and the manufacturing producers on the other. The ideal condition of the State, economically speaking, is reached when, by the law of supply and demand, these classes are in a position of economic equilibrium, when the manufacturers and traders are sufficiently numerous to consume all the surplus the farmer produces. This state of affairs insures a division of labor; it leads the different branches of industry to lean upon one another and to recognize and feel their mutual interdependence and need of one another; and it secures to each class a market near at hand for its products or its services. But foreign interference, which competes with the native industry—which, for example, by underselling the manufactures, drives them out of employment,—disturbs this economic equilibrium, and in so doing to a great

extent deprives the farmer of a market for his goods, and the trading classes of their opportunities to effect exchanges; in other words, it diminishes the number of profitable industries and forces the whole population into some few pursuits which speedily become overcrowded. Protection, by excluding such foreign interference, tends to preserve the economic equilibrium and thus ensures the welfare of all.

(2) *The "New Country" Argument.* This line of argument is rather in support of protection as a temporary than as a permanent system, and to some extent was allowed to be reasonable by no less an authority than the late John Stuart Mill, himself in theory a free-trader. It is neatly put by Professor Robert Ellis Thompson, as follows:

"Were the world in an ideal state of harmony and equality, and were all its peoples equally strong in accumulation of industrial capacity and of capital, in intelligence, and in freedom from burdensome taxation, then the 'let-alone' policy would be the right one. But the actual world is full of inequalities and disadvantages; and experience shows that unrestricted trade between its stronger and richer, and its weaker and poorer countries, puts very great hindrances in the way of the latter. For the former, by an undue concentration of their attention and resources upon manufacturing, can produce a surplus of articles which are easy of transportation, and can be sold in those other countries cheaper than if made there. The individual buyer goes to the cheapest seller; the interest present to his mind is that of spending to the best advantage the money he has in hand. And thus the foreign competition crushes out the home production of all but the rudest and coarsest articles of manufacture, and prevents the establishment of a varied industry, unless the government interfere, as the personification of the nation and its co-ordinating power, to restore the equilibrium by discouraging these imports. Especially is this difficulty experienced in new countries, whose settlers bring with them the Old World's appreciation of modern appliances, comforts, and luxuries, while the home industries needed to supply these wants are still undeveloped. Until such a country has attained a diversified industry, advanced at nearly all points to a full equality with that of the most advanced nations, its manufacturing class are, in the absence of protection, at the mercy of their foreign competitors. If we could consider the citizens of such a country merely as purchasers and consumers of such commodities, then it might seem that they simply gained by free access to the foreign producer. But they have also to produce something to be given in exchange, and find a market for that. 'To buy in the cheapest, and sell in the dearest, market' accessible, is the unreflecting instinct of everybody; but when the former is furnished by the foreigner, it is generally found that the home producer has no 'dearest market' to sell in, but only a 'cheapest' market for that purpose also. And when he reckons up his purchases and sales, or considers his transactions as an exchange of commodities, he will find that he has lost far more than he has gained,—'far fetched is dear bought' the world over. His country may be getting its commodities for the time at cheap rates, but it is bartering for them the very power to produce such commodities—the power to create on its own soil the home-markets whose relative cheapness or dearness will be in favor of all classes."

(3) *The "Varied Industries" Argument.* It is better for a country to have many than few industries, for the following reason among others: Those who produce raw materials—cotton, wool, iron, food—must send them to the great centres of manufacture and consumption, to render them most valuable: the cotton and wool to be spun; the iron ore to be manufactured; the food to be purchased and consumed. Now if these centres of manufacture and consumption are near the sources of production, the producers save the heavy cost of transporting their produce to the point where it is to be made available. In other words, the prices of raw materials and of the manufactured goods approximate most closely in the neighborhood where they are both produced and are mutually exchanged; and hence, if the industries of a country are varied, the prices are equalized to both consumer and producer, to the mutual advantage of each class. Protection keeps in our country the manufactures and mills that take the raw material directly from the consumer, and thus prevents the wide divergence in price between the raw material and the manufactured article.

(4) *The "Independence of Foreigners" Argument.* If any nation becomes dependent upon foreign countries for its supplies of manufactures or for its raw material, a state of war which is always possible, suddenly and remorselessly cuts off the sources of supply and produces great suffering and inconvenience. In 1861-5, the cutting off by blockade of our southern ports from communication with Europe, caused intense suffering in the English manufacturing districts. (See COTTON FAMINE.) In like manner, if we were to become dependent upon Europe for our manufactures, and ourselves only to produce the raw material, a war with a great naval power would at once shut off our sources of foreign supply and produce the greatest possible inconvenience. On the other hand, at the present time, under the policy of protection, we both produce our raw material and manufacture it into goods. We are almost wholly independent of foreigners, and if a complete blockade were to shut us off from all communication with the civilized world for years, we should only miss a few of the luxuries, and scarcely know the difference in other ways. This state of affairs would, of course, not be possible for countries of limited area like England which are forced by natural conditions to look abroad for much that they consume; but the United States possess the great extent

of territory, the diversity of climate, and variety of production necessary for their own maintenance, and it is only the part of wisdom to adopt such an economic policy as will give our citizens the full benefit and enjoyment of all that nature has made available.

(5) *The "Benefit to Farmers" Argument.* If the farmer has to depend on the foreign market for breadstuffs, he is wholly at the mercy of foreign harvests and foreign conditions, as well as upon local circumstances. Moreover, he must spend a large portion of his returns in getting his goods to market. Under the operation of free-trade this would be his condition. While it is true that he would then be able to purchase manufactured articles at lower prices, his own income would not only be diminished by the transportation-tax upon his products, but it would be much more uncertain and precarious. Under a protective system, however, the farmer has, near by, communities engaged in manufacturing, who steadily purchase and consume the food that he has to sell. In other words, under protection, the American farmer has two markets for his produce, and one of them is at his very doors; while under free-trade he must largely depend upon the uncertain needs of foreign countries, and suffer the continual competition of those of his own countrymen who, being unable to engage in manufacturing pursuits, must of necessity betake themselves to agriculture. At the present time, of the wheat shipped from the West, only about one-sixth is exported to Europe, the rest being consumed in our own country. Of course if the time should ever come when our country produces only enough for its own use, then protection would be of no great benefit to the farmer, for he would in any case be certain of a market for his goods: but at the present time, and in all probability for many years to come, the production of our breadstuffs will far exceed what is necessary for home consumption.

(6) *The "Labor Market" Argument.* The diversity of industries secured by the principle of protection, is particularly advantageous to those who gain their living by manual labor, and who, as it is said, "have labor to sell." A variety of industries causes competition among the employers of labor, and this competition naturally enhances the wages paid to the workingmen. It is found to be universally true that where one industry is wholly, or almost wholly, dominant over others, there the rate of wages is a low one. In Ireland, where agriculture is almost the only pursuit, in North Belgium, and in the agricultural districts of England, wages are disproportionately low compared with the prevailing standard in the districts where manufactories are numerous. Furthermore, in agricultural communities, only the labor of able-bodied men is in much demand, and skill, ingenuity, and intelligence, unless coupled with bodily strength are underpaid and little valued. But when the industries are varied, there exists a demand for every kind of labor — for that of boys and women, as well as for that of men; and skill and dexterity are highly prized. In such communities we have all the members performing a useful part, instead of a few laboring and the rest living in idleness on the proceeds of their industry.

(7) *The Historical Argument.* History shows us that in our own national development, prosperity and activity both financial and intellectual, have invariably followed the stimulus given to manufactures by a protective tariff. Until Maine began to use her water-power and to establish mills, her people were restricted to agriculture and lumbering, and were conspicuous for their poverty and lack of progress. So, too, in the years between 1833 and 1842, throughout the whole country, money was scarce, and while food was plenty, comforts were difficult to procure, and the life of the people was crude and bare. For a variety of employment not only stimulates the general prosperity of any people, but quickens their intellectual activity by giving full play to their ingenuity, by encouraging their inventiveness and resourcefulness, and rewarding their mechanical skill. The American people have now a high place in the history of invention by the brilliant discoveries of Eli Whitney, and Fulton, and Morse, and Edison; and the direct encouragement to these discoveries was the rich reward held out to inventive genius through the spirit of protection, which, as the history of tariff legislation shows, almost from the first received the significant name of "the American System."

FREE TRADE. It must again be stated that by the term "free trade," in this country, at least, is meant not the total abolition of all customs duties, but the restriction of those duties to the single purpose of providing revenue for the government, and without regard to the protection or assistance of any native industry. The chief arguments advanced by the American advocates of free trade are as follows:

(1) *Free Trade is a Natural Right.* No one questions that the simplest and most obvious of the natural rights possessed by the individual is the right of free exchange. That right is simply a permission to make the best possible use of his experience and judgment in purchase or sale, with the object of making such means as he possesses secure to him as much as possible in the exchange that he makes. Free exchange is only one of the many aspects of personal liberty. A man by hard physical or intellectual labor earns a certain sum of money. Natural right would allow him to spend it where its purchasing power is the greatest; it would give him the power of making the best bargain possible. The system of free trade simply recognizes this natural right. It says to all: "Buy where you can buy cheapest; spend your hard-earned money where it will buy the most." On the other hand, the protective system says: "You must not be allowed to exercise your judgment and experience in buying and selling.

You must, for the benefit of a few manufacturers, buy where goods are dearest, and where you will get the least return for your money." Protection thus assumes to make a man's bargains for him, to direct the employment of his capital, and to prevent him from disposing of his labor and the fruits of it, to the best advantage.

(2) *Free Trade is Fairest to all Classes.* Protection can only be effectual by being partial. For if all classes were equally protected, the prices of all goods would rise equally, and the relative position of affairs would not be changed. If, in other words, all producers received protection, foreign trade might cease, and so far as concerns home-trade, every one would pay more than he would have given had trade not been protected. Such a system, says Prof. Thorold Rogers, prevails in Munich, so far as manufacturers go, where every artisan belongs to some guild or other, and, in consequence, all manufactures in that city are bad and dear. Protection, then, in its very essence, is protection of *some* occupations rather than *all* occupations; and by shutting out competition in these occupations, it raises artificially the prices on the products of these occupations, thus constituting a tax which must be paid by all consumers. Hence, protection establishes favored classes in the community and is in consequence essentially unfair. Free trade, on the other hand, treats all classes and all occupations exactly alike, imposing no restrictions at all.

(3) *Free Trade secures to Capital its most productive Employment.* If capital in any country flows of its own accord into any industry, it is clear that such an industry needs no protection. It is because, under particular circumstances, capital is not so advantageously employed in certain callings that the State attempts to divert capital from a more productive to a less productive channel. If protection is needed to sustain a manufacture, the very act implies that, without this assistance, the trade would be carried on at a loss; in other words, it would not be carried on at all. Tea and coffee could perhaps be cultivated in hot-houses if the legislature of any country resolved on protecting such an industry by restraining foreign importation. Of course such an act would be madness, as the produce would cost probably fifty times as much on the adoption of such means. But there is only a difference in degree between such an expedient and that of a protective duty on corn, or iron, or tin, except that, in so far as the use of these latter articles is necessary, the loss and the mischief are the greater.

(4) *Free Trade admits of a Variety of Industries, especially in the United States.* Every country enjoys a *natural protection* to its manufactures. When the article is cheap and bulky, the cost of carriage is equivalent to a prohibitive duty; when it is cheap and light, the same element of cost, amounting to a considerable percentage, is a protective impost. In the great majority of cases this charge, and similar incidents attached to foreign commerce, are abundantly sufficient to give a legitimate stimulus to home production. That "trial under a new set of conditions," if the expression means anything at all in relation to manufactures, a notion which one may reasonably take the liberty to dispute, is best satisfied when the conditions are those of remoteness from the foreign market, and uncertainty of supply or cost.

Besides, the reasons which can be alleged against the diversion of capital from more profitable into less profitable channels, which is the necessary result of protective regulations, apply with overwhelming force to young and rising nations, that is, to communities whose territory is imperfectly occupied. Such societies almost invariably suffer from a dearth of capital. The natural resources of the community are so vast, so undeveloped, so unappropriated, that most of those persons who constitute the community in question can employ every particle of capital productively and are eager to obtain more. The rate of interest in young countries is always high, for lenders are scarce, borrowers numerous. It is the height of folly, then, to starve such capital as does exist by wasting a portion of it in occupations or employments which are imperfectly productive, and which need, despite the natural advantages attached to home-production, the artificial assistance of legislative protection in order that they may exist.

There is an argument constantly alleged in favor of a protective system, which is not so much economical as political or social. It is a favorite practice, especially with the protectionist orators, and partisans in the United States, to insist that it is the duty of government to do its best to develop all industries; not so much in order that the country may be relieved from the necessity of depending on the foreign producer, as that the employments of the citizens should be as varied and the nation as self-contained as possible. We do not want, these people say, to have the whole community engaged in the production of raw materials; we want manufacturers as well as farmers, artisans as well as agriculturists. It has been already said that they must have this variety from the natural protection afforded to all countries in consequence of their distance from the foreign market. If the importation of foreign goods into the United States were wholly free, or at least if no duty were imposed on foreign products in excess of taxes at home, the Pennsylvanian or New England manufacturer would still enjoy great advantages over the foreign importer in the markets of Illinois, Missouri, and Ohio, because he is several thousand miles nearer to his customer, and can be much more easily informed of his customer's wants.

(5) *Protection, by preventing healthy competition, fosters Monopolies.* One very impor-

tant practical objection to the adoption of a protective system is the difficulty of deciding honestly what particular industries shall receive protection ; and again of determining when the protection is to cease. In 1861 our American manufactures were described as "infant industries," and protection was asked for them ; but now, in 1891, after thirty years of protection, an even higher tariff is established, although the original plant has been put in and paid for hundreds of times over, and the value of the goods manufactured is more than \$8,000,000,000 per annum, while in many foreign markets, American goods are actually underselling those of foreign producers. It is clearly manifest, and the history of American protection proves the assertion true, that in selecting the favored industries, in determining the proper amount of protection, and in prolonging the term of protection, there is room for every possible form of intrigue, of political corruption, and of sectional discrimination ; so that in the development of the system, the massing together of great interests forms a powerful means of demoralizing the legislative body whose function it is to make or modify these concessions. By reason, partly of partisan influences, partly because of misrepresentation by those most interested, and partly because of ignorance or indifference, the tariff rate has often laid a far heavier duty upon foreign products than what was necessary to prevent them from underselling the corresponding American goods. It has been made so high as to shut out any competition whatsoever, and has allowed the native manufacturer to place an unduly high price upon his wares, which the general consumer has to pay because he has no choice. Protection has often, in fact, worked to the disadvantage of the American consumer and to the benefit of the foreigner. In June, 1891, attention was publicly called to a firm of opticians in Philadelphia who were selling in London certain lenses at a price 20 per cent. cheaper than that at which they sold them in Philadelphia. Being protected by a heavy tariff, they feared no competition in the United States, and so put up their prices in selling to their own countrymen. If, after paying the cost of transportation to England, they could compete with Englishmen, they would scarcely seem to be in need of protection at home ; yet probably these same manufacturers would declare themselves ruined if a committee of Congress were to propose the abolition or reduction of the duty on these lenses. And what is true of this one industry is true of many others. American firms to-day are selling goods in Europe and in Canada at prices lower than those asked of their own countrymen. Thus, in many cases, the protective tariff protects the foreigner at the expense of the native consumer. Perhaps the most widely reaching danger of the protective principle is this : that it prevents competition and fosters the growth of the monopolies and trusts (see TRUST), which during the past ten years are overshadowing the smaller industries and concentrating enormous aggregations of capital in the hands of a comparatively few men. The social dangers resulting from this state of things are growing more and more plain with every year, and the widespread dissatisfaction that is beginning to prevail has an ominous tendency to threaten, at least remotely, the security of all capital and the sanctity of private property.

(6) *Free Trade does not lower Wages.* This is a truth that is not generally admitted by protectionists, the theory being in general that protection by raising prices, generally raises wages as well, while free trade puts everything "on a cheap basis." But wages are subject to many other laws, and it is a fact not generally known that of the different countries of Europe, England, the only free-trade country, pays its workmen the highest wages ; and Germany, where a high protective tariff prevails, pays its laborers the lowest. Furthermore, in England itself, higher wages prevail now than were paid fifty years ago under the old protective system. Again, it is a mistake to suppose, as so many do, that increasing the cost of articles by means of a tariff, increases the wages of the laborers engaged in making them. What is really increased is the profit of the manufacturer who furnishes the capital, while the workingman not only secures no more than before, but actually less by reason of the increased cost of living. Under the new McKinley tariff the cost of the following articles, that are used by every workingman, has been largely increased, while wages certainly have not risen since the tariff went into effect : blankets, brushes, buttons, clocks, cotton trimmings, cotton handkerchiefs, cotton hosiery, cutlery, eggs, felt hats, flannels, glassware, knit-goods, oatmeal, rubber overshoes, cotton thread, tinware, lamp-wicks, worsted yarns, and woolen manufactures. The result has simply been to enhance the profits of the protected manufacturer and to increase the cost of living to all other persons, the workingman included.

(7) *Free Trade is economically desirable,* for it is the natural law of the community ; it is consistent with the liberty of the individual to purchase in the most advantageous market ; it allows capital to flow into the most productive channels instead of forcing it into artificial and unnatural directions ; it does not tax the many to benefit the few ; it permits and encourages competition and prevents monopolies ; and finally it allows the complicated questions of trade and commerce to work out their own natural and simple solutions, without the unwise, interested, and often purchased interference of political bodies.

FAIR TRADE. This is a term that has of late come into vogue in England to describe a system advocated by some statesmen, and having the same meaning as the American term Reciprocity (q.v.).

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TARIM RIVER. See TURKISTAN.

TARIN. See ABERDEVINE.

TARLATAN, a thin, gauze-like fabric of cotton, used for ladies' ball-dresses, etc. It is usually dyed or printed in colors. Tarare, in France, is the chief centre of this manufacture, whence it is largely exported. Switzerland alone competes with France in the production of tarlatan, but those of the latter country far surpass the former in fineness.

TARLETON, Sir BANNASTRE, 1754-1833; b. England; a lieut.col. in the army of Cornwallis during the revolutionary war. At the head of a loyalist force known as "the British legion," he inflicted considerable damage upon the Americans in the south. He massacred Col. Buford's regiment at Waxhaw creek, 1780, but was defeated the next year, near Cowpens, by Gen. Morgan, with a smaller force. He was with Cornwallis till the end of the war. He was elected to parliament in 1790, and made maj.gen. in 1817. He wrote a *History of the Campaigns of 1780 and 1781 in the Southern Provinces of North America*.

TARLETON, RICHARD, an English actor and dramatic writer of the time of Queen Elizabeth, said to have been born in Shropshire. He excelled in comic parts, and, besides, won much reputation for his extemporaneous jests, so that his name was used for many years to account for the paterfity of many current jokes, as was later the case with the name of "Joe Miller" (q.v.). A collection of these jests was made at the time, and has been reprinted in part during the last ten years in London. Many of them seem to modern taste pointless or silly, and many others simply obscene. Tarleton won the favor of the queen, who even made him a groom of the Chambers. He is known to have written at least one play, *The Seven Deadly Sins*, which has been lost. He died in 1588.

TARN, a department in the s. of France, bounded on the n. by the departments of Aveyron and Tarn-et-Garonne, receives its name from the river Tarn. Area, 2317 sq.m.; pop. '96, 339,827. The surface is in general elevated, and in the s. and s.e. are the montagnes Noires and the monts de l'Espinois, branches of the Cévennes. The principal summit, the Rock of Montalet, is 4430 feet high. The surface is well wooded, and there are extensive vineyards. The chief river, the Tarn, an affluent of the Garonne, has a course of 235 miles. Albi is the capital.

TARN. A word borrowed from the Icelandic *tiörn*, and properly applied to a small mountain lake, but in common usage given also to any dark pool or still body of water.

TARN-ET-GARONNE, a small department in the s. of France, bounded on the s.e. by the department of Tarn. Area, 1436 sq. m.; pop. '96, 200,390. The principal river is the Garonne, which flows n.w., and its affluents, the Tarn and Aveyron. The surface is marked by plateaux, about 1000 ft. in average altitude; the highest hills do not rise above 1600 feet. The climate is beautiful, healthy, and temperate. Cereals are raised in great quantities. There are manufactures of paper, silk, and soap, and much wine is produced. The department is divided into the three arrondissements of Montauban, Castelsarrasin, and Moissac. Montauban is the capital.

TARNOPOL, a t. of Austria-Hungary, in Galicia, charmingly situated on the left bank of the Sered, 73 m. e.s.e. of Lemberg. There are manufactures of leather and soap, and a considerable trade. Pop. '90, commune, 27,405.

TARNOW, a t. of Austria-Hungary, in Galicia, near the right bank of the Dunajec, a navigable tributary of the Vistula, and 47 m. e. of Cracow. It has a fine cathedral. Pop. '90, commune, 27,574.

TARPAULIN, a large sheet of the coarsest kind of linen or hempen cloth, saturated with tar to render it waterproof. It is used for covering loaded wagons, the hatchways of ships, and similar things, as a temporary protection from wet.

TARPEIAN ROCK (Lat. *Rupes Tarpeia*, or *Mons Tarpeius*), the name originally applied to the whole of the Capitoline hill (see CAPITOL), but latterly confined to a portion of the southern part of the hill, the following being the legend commonly related in connection with it. In the time of Romulus, Tarpeia (a vestal virgin), the daughter of Sp. Tarpeius, governor of the Roman citadel on the Capitoline, covetous of the golden ornaments on the Sabine soldiery, and tempted by their offer to give her what they wore on their left arms, opened a gate of the fortress to the Sabine king, Titus Tatius, who had come to revenge the rape of the Sabine women. "Keeping their promise to the ear," the Sabines crushed Tarpeia to death beneath their shields, and she was buried in the part of the hill which bears her name. Subsequently it was not unusual for persons condemned on the charge of aspiring to restore the monarchy, or of treason to the state generally, to be hurled from the Tarpeian rock—e.g., the famous Manlius, the savior of the capital during the invasion of the Gauls.

TARQUINI, CAMILLO, 1810-74; an Italian Jesuit of noble family; joined the society of Jesus in 1837, in 1850 became professor of Canon law in the Collegium Romanorum, and in 1873 was made cardinal-deacon. He published *Juris Ecclesiastici Publici Institutiones* (1862), and several monographs.

TARQUINIUS, the family name of two kings of Rome, with whose history, or rather with the legends regarding whom, the fortunes of the city are closely interwoven. The story goes that Demaratus, a Corinthian noble, emigrated from Greece, and settled at Tarquinii, in Etruria, where he married an Etruscan wife, by whom he had two sons, Aruns and Lucumo. Aruns died during his father's lifetime, but Lucumo married into one of the noblest Etruscan families. His wife, named Tanaquil, was a bold, ambitious and wise woman. By her advice, Lucumo resolved to go to Rome. He set out, accompanied by a large train of followers, and as he approached the Janiculum, an eagle swooped down, and snatching off his cap, carried it up to a great height, then descending, placed it on his head again. Tanaquil, who was deeply skilled in the science of augury, prophesied from this omen the highest honors for her husband, who was hospitably received at Rome, and soon after admitted to the rights of citizenship, whereupon he took the name of L. Tarquinius, or, according to Livy, L. Tarquinius Priscus. The Roman monarch, Ancus Marcius, appointed him guardian of his children; and on the death of the former, the senate and the citizens unanimously elected him to the vacant throne. His reign was a glorious one. Against the Latins, Sabines, and (according to Dionysius) the Etruscans, he waged successful war, forcing the whole of the twelve sovereign cities of Etruria to recognize his supremacy, and do him homage. But the works that he executed at home are even more renowned than his exploits abroad. To L. Tarquinius Priscus (*Priscus* is commonly translated the "elder;" but Niebuhr objects to this translation as involving an anachronism, and notices the fact that *Priscus* is a common cognomen among the Romans) are ascribed the construction of the magnificent *Cloaca*, or sewers (see, however, CLOACA MAXIMA), which remain uninjured to this day; the laying out of the circus Maximus and the Forum; the institution of the great or Roman games; and (some say) the building of the Capitoline temple (see CAPITOL). The legend also represents him as effecting certain political and sacerdotal changes. See ROME. Tarquinius was assassinated after a reign of 38 years, at the instigation of the sons of Ancus Marcius, who considered themselves as best entitled to the throne, and dreaded lest he should use his influence to get his favorite and son-in-law, Servius Tullius, chosen as his successor. But their crime did not avail them, for, through the dexterity of Tanaquil, Servius was elected to the vacant throne, and signalized himself not only by his military exploits, but also by great organic changes in the Roman constitution (see article ROME for an account of the "Servian reform"). Tarquinius left two sons, L. Tarquinius Superbus and Aruns, both of whom married daughters of Servius Tullius; and two daughters, one of whom married Servius Tullius himself and the other M. Brutus, by whom she became mother of L. Brutus, first consul of the Roman republic.

L. TARQUINIUS SUPERBUS, son of the preceding, having murdered his father-in-law, Servius Tullius, at the instigation of his wife, is represented in the legend as audaciously usurping the vacant throne; but as the whole drift of his legislative policy was to abolish the reforms of Servius, there can be little doubt that the real significance of this part of his career lies in the fact that it indicates a successful reaction, on the side of the patricians, against the more liberal and progressive policy of the preceding age. That the younger Tarquinius, at least, is a historical character, seems to be pretty generally allowed. The incidents of his career are so numerous and coherent, and the impress of his name and character is so deeply stamped on the national memory, that he cannot be regarded as a wholly imaginary personage. Analyze the story how we may, there will always remain a residuum of insoluble fact, not essentially at variance with the character of the tragic tradition. As far as we can gather from the ancient annals, the usurpation of Tarquinius was probably achieved by the help of an enterprising section of the nobles, who clung tenaciously to their privileges, and could not endure the constitutional recognition of the *plebs*. It does not appear that the whole of the senators connived at or even approved of Tarquinius's procedure. We are expressly told that he drove numbers of those whom he mistrusted into exile; in other words, he persecuted and banished the adherents of the Servian policy of conciliation. Like a Turkish tyrant, he surrounded himself with a body-guard—another indication of the original insecurity of his position, and strengthened himself by foreign alliance, marrying his daughter to Octavius Mamilius, prince of Tusculum. By means of subtle and unscrupulous intrigues he obtained or consolidated the Roman hegemony in Latium; offered sacrifice in the name of all the Latins at the Alban mount; fused the contingents of the latter with the Roman legion; put to death as traitors such of their chiefs as opposed him (e.g., Turnus Herdonius); and, at the head of the combined forces, penetrated into the Volscian marshes, and subdued the natives. On his return he completed the building of the capitol, which the elder Tarquinius had begun, and deposited in the vaults the Sibylline books he had curiously acquired. See SIBYL. He next conquered the town of Gabii (where many of the banished nobles had found shelter), through an elaborate stratagem, in which his son Sextus played the principal part. But his lavish expenditure both in war and peace necessitated the imposition of heavy taxes, and murmurs of discontent were heard among the people. The patience both of plebs and patricians was beginning to give way. Coincident with this state of things a fearful omen was beheld: from the altar in the royal palace crept forth a serpent, and devoured the entrails of the victim. Tarquinius sent two of his sons, Titus and Aruns, to Delphi to consult the oracle. They were accompanied by their cousin, L. Junius Brutus (q.v.), who had long feigned himself a fool in order to save his life, for Tarquinius had killed his father and brother in order to possess himself of their great wealth. On their return they found that the king had opened war upon the Rutuli, and was besieging Ardea, whereupon they joined the Roman camp. Here occurred, between Sextus and Collatinus, the famous dispute about the virtues of their respective wives, which led to the rape of Lucretia. The details of this legend are so familiar that it is unnecessary to recount them. Suffice it to say that it roused such a storm of indignation that the people of Collatia (where the shameful deed was done) rose in arms, and renounced their allegiance to Tarquinius. Brutus carried the news to Rome, and the senate, fired with a righteous anger, deposed the tyrant; finally, the army before Ardea also revolted. Tarquinius and his sons were obliged to flee, and an aristocratic republic was constituted at Rome. Three different attempts were made to restore Tarquinius by force: first, by his own Etruscan kinsmen of Tarquinii; second, by Lars Porsena (q.v.) of Clusium; and third, by his son-in-law, Octavius Mamilius, "prince of the Latian name," all of which, according to the legend, failed; and at length Tarquinius, utterly baffled and beaten, retired to Cumæ, where he died, a wretched and childless old man, for all his sons had met death before him.

TAR RAGON. See ARTEMISIA.

TARRAGO'NA, a province in n.e. Spain, part of the ancient division of Catalonia or Cataluna, lying on the Mediterranean and adjoining the provinces of Teruel, Saragossa, Barcelona, Castellon, and Lérida, drained by the Ebro and a few streams of little importance; 2451 sq. m.; pop. '87, 348,579. There is much mountainous surface, the Prades range crossing the province from n. to s.; but the valleys and lower slopes are very rich in soil and covered with vineyards, from which excellent wine is produced; other exports are brandy, cork, silk, velvet, and woolen and cotton goods. Capital, Tarragona.

TARRAGO'NA, a seaport of Spain, capital of the modern province of the same name, stands on the Mediterranean shore, at the mouth of the Francoli, 60 m. w. of Barcelona. It consists of two portions—the upper (the ancient) and the lower (the modern) towns. The former stands on a hill 720 ft. high, and is girdled with ramparts. The lower town, completely separated from the higher by a line of works, is regular and open, and is defended by two forts. The beautiful cathedral, in Gothic and Norman, and which dates from the middle of the 12th c., is the principal edifice. There is an interesting antiquarian museum, rearranged in 1868. There is a growing trade in grain, wine and oil; and fruit is largely exported. The harbor is safe for the vessels that visit Tarragona. Pop. '87, 27,255.

Tarragona, called by the Romans *Tarraco*, was founded by the Phenicians (who called it *Tarchon*, citadel), and afterward became the capital of the Roman province of Tarracensis. Among the Roman antiquities are the remains of an amphitheatre, which has been used as a quarry; a magnificent aqueduct, 96 ft. high and 700 ft. long—still in use—and near the town the tower of the Scipios, much decayed. Tarragona was taken and cruelly sacked, in June, 1813, by the French under Suchet.

TARRANT, a co. in n.e. Texas; 900 sq. m.; pop. '90, 41,142. Co. seat, Fort Worth.

TARRYTOWN, a village in Westchester co., N. Y.; on the Hudson river and the New York Central and Hudson river railroad; 27 miles n. of New York. The Hudson at this point has a lake-like expansion called the Tappan Zee, and Tarrytown, which is built on the side of a hill, commands an extensive view. It is noted as the scene of the capture of Major André and as the burial-place of Washington Irving. Sleepy Hollow is included in its precincts. The village has many objects of general interest, a Revolutionary soldiers' monument, Irving institute, Y. M. C. A., and Y. M. Lyceum libraries, national bank, manufactories of shoes, tiles, and plumbers' tools, and weekly newspapers. Pop. '90, 3562.

TARSHISH, probably the same as *Tartessus*, a city and emporium of the Phenicians in Spain, somewhere near the mouth of the Guadalquivir. It is frequently mentioned in Scripture, notably so in connection with the prophet Jonah, who took ship for Tarshish, when he sought to "flee from the presence of the Lord."

TARSIA-WORK, a beautiful kind of marquetry made in Italy. It is produced by inlaying pieces of colored wood so as to represent figures and landscapes. That of Sorrento is very celebrated; and lately, many fine pieces of this work have been made in Perugia. It is usually applied to the decoration of cabinet-work.

TARSUS, anciently the chief city of Cilicia, and one of the most important in all Asia Minor, situated on both sides of the navigable river Cydnus, in the midst of a beautiful and productive plain, and about 18 m. from the sea. It was a great emporium for the traffic carried on between Syria, Egypt, and the central region of Asia Minor. In the time of the Romans, two great roads led from Tarsus, one n. across the Taurus by the "Cilician Gates," and the other e. to Antioch by the "Amanian" and "Syrian Gates." Tarsus, judging from its name, was probably of Assyrian origin; but the first historical mention of it occurs in the *Anabasis* of Xenophon, where it figures as a wealthy and populous city, ruled by a prince tributary to Persia. In the time of Alexander the Great, it was governed by a Persian satrap; it next passed under the dominion of the Seleucidæ, and finally became the capital of the Roman province of Cilicia. At Tarsus, Anthony received Cleopatra, when she sailed up the Cydnus, with magnificent luxury, disguised as Aphrodite. Under the early Roman emperors, Tarsus was as renowned for its culture as for its commerce, Strabo placing it, in respect to its zeal for learning, above even Athens and Alexandria. It was the birthplace of the apostle Paul, who received the greater part of his education here; and here the emperor Julian was buried. Gradually, during the confusions that accompanied the decline of the Roman and Byzantine power, it fell into comparative decay; but even yet, it is—under the name of *Tarso* or *Tersus*—the most considerable place in the s.e. of Asia Minor, has a pop. of about 10,000.

TARTAN, or **PLAID**, a pattern woven in cloth, in which bands of different colors are woven or printed side by side, both the warp and weft way of the material, thus giving the well-known checkered pattern. This is probably the oldest pattern ever woven; at all events, the so-called shepherd's plaid of Scotland is known to have a very remote antiquity among the eastern nations of the world. The plaid pattern admits of a very great variety of modifications, by the introduction of different colors, and by varying the amount of each color employed. These colored plaids were in great favor in the Highlands of Scotland, where each clan wore a particular kind as its distinctive dress.

TARTAR, a mixture of bitartrate of potash and tartrate of lime (see **TARTARIC ACID**), is a deposit formed from wine, and known in its crude form as argol (q.v.). About 900 tons annually of this substance are imported into Great Britain, from the chief wine-producing countries of Europe and the cape of Good Hope.

The word *Tartar*, which gives the name to tartaric acid, is derived from the Greek *Tartaros*, hell. "It is called *Tartar*," says Paracelsus, "because it produces oil, water, tincture, and salt, which burns the patient as Tartarus does."

TARTAR, CREAM OF. See **TARTARIC ACID**.

TARTAR, FOLIATED EARTH OF, an old name for acetate of potash, in consequence of the foliated satiny masses in which that salt occurs.

TARTAR, SOLUBLE, a term applied by some chemists to neutral tartrate of potash, and by others to borotartaric acid. See **TARTARIC ACID**.

TARTAR OF THE TEETH is a deposit of salts of lime and organic matter from the saliva, and usually occurs most abundantly on the inferior incisors. If it is suffered to accumulate, it causes inflammation and absorption of the gum, and gradual loosening of the teeth. The accumulating of this substance may usually be prevented if due attention is paid to the cleaning of the teeth. "The teeth," says Dr. Druitt, "should be cleaned at least twice a day with a soft tooth-powder (precipitated chalk is best) and a little soap. The hairs of the tooth-brush should be soft, and not too closely set, so that

they may penetrate the better into the interstices of the teeth." When the tartar has accumulated to any extent, it must be removed by the *scaling instruments* of the dentist.

TARTARIC ACID. Ordinary tartaric acid, $C_4H_6O_6$, is usually seen in the form of colorless, transparent, oblique, rhombic prisms, which are not affected by the action of the air, have an agreeable acid taste, and are soluble in water and alcohol. The crystals when gently warmed become strongly electric, the opposite sides of the crystals exhibiting the opposite forms of electricity. On heating tartaric acid to about $275^\circ F.$ ($135^\circ C.$), it fuses; and at a slightly higher temperature it becomes changed, without losing weight, into an isomer, *metatartaric acid*. On further heating to about $302^\circ F.$ ($150^\circ C.$), two molecules of the acid lose one equivalent of water, and *tartralic acid*, or *ditartaric acid*, $C_8H_{10}O_{11}$, is formed. If the temperature be raised to $356^\circ F.$ ($180^\circ C.$), half the basic water is expelled, and *tartralic acid*, $C_8H_8O_{10}$, is formed; and finally, all the basic water is driven off, and *anhydrous tartaric acid*, or *tartaric anhydride*, $C_4H_4O_6$, remains in the form of a white porous mass insoluble in water, alcohol, or ether. If, however, it be allowed to remain long moist, it gradually becomes converted into crystallized tartaric acid. Finally, on distilling tartaric acid in a retort at a temperature of $400^\circ F.$ ($204.5^\circ C.$) and upward, it is decomposed into certain gases and empyreumatic oily matters, water, and acetic, pyruvic (or pyracemic) and pyrotartaric acids.

Oxidizing agents, such as peroxide of lead or nitric acid, readily act upon tartaric acid, and convert it into formic and carbonic acids; and when fused with caustic potash, it splits up into acetic and oxalic acids. It is one of the strongest of the organic acids.

This acid occurs abundantly in the vegetable kingdom both in the free and combined state. It is found as a free acid in tamarinds, grapes, the pine-apple etc.; and in combination with potash and lime in tamarinds, grapes, mulberries, and the unripe berries of mountain-ash, and in small quantity in the juice of many other vegetables. It is, however, from argol (q.v.), a product of the fermentation of grape-juice, that the tartaric acid of commerce is obtained. The details of the process may be briefly described as follows: argol, or crude bitartrate of potash, is dissolved in boiling water, and chalk is added as long as effervescence occurs. An insoluble tartrate of lime is precipitated, and tartrate of potash remains in solution. This tartrate of potash is converted by the addition of chloride of calcium into insoluble tartrate of lime and soluble chloride of potassium. The tartrate of lime obtained by these two operations, if treated with sulphuric acid, readily yields free tartaric acid in solution, with sulphate of lime as a precipitate. The filtered liquid, when cooled and evaporated, yields tartaric acid in crystals.

Tartaric acid is used in large quantity by calico-printers and dyers for the removal of certain mordants, and is much employed in medicine in the preparation of effervescing draughts and for other purposes.

Tartaric acid being bibasic, can form both acid and normal (or neutral) salts, according to the two general formulæ, $M.H.C_4H_4O_6$, and $M_2.C_4H_4O_6$, when M signifies any monad metal. The normal salts may contain (1) two similar or (2) two different protoxides, or (3) a sesquioxide, or (4) a protoxide and a trioxide; as, for example—(1) Normal potassium tartrate, $K_2.C_4H_4O_6$; (2) Sodium potassium tartrate, also called Rochelle salt, $NaK.C_4H_4O_6$; (3) Ferric tartrate, $Fe_2(C_4H_4O_6)_3$; (4) Potassio-antimonious tartrate, or tartar emetic, $2K(SbO)C_4H_4O_6 + H_2O$. The tartrates are for the most part formed by partially or entirely saturating the free acid with an oxide or carbonate, or in the case of neutral tartrates containing two oxides, by saturating a solution of the bitartrate of one oxide with the other oxide. The most important tartrates are the following:

Normal potassium tartrate, $K_2.C_4H_4O_6$, a soluble salt, which crystallizes with difficulty, and is formed in preparing tartaric acid from *bitartrate of potash*, $KHC_4H_4O_6$. This salt is prepared from argol by extraction with boiling water, which dissolves about one sixth of its weight. As it is much more insoluble in cold water, of which it requires 240 parts, it crystallizes readily as the hot solution cools. The snowy white rhombic prisms which are thus deposited constitute *cream of tartar*. When heated to redness in a covered crucible, a charred mass, consisting of carbonate of potash and charcoal in a fine powder, remains, and is used in the laboratory for reducing operations under the title of *black flux*; and if cream of tartar is deflagrated with twice its weight of niter, *white flux*, also a reducing agent, consisting solely of carbonate of potash, is obtained. *Sodium potassium tartrate* has been already described in the article ROCHELLE SALT. *Potassium ferrous tartrate*, or *ferrum tartaratum*, $K_2Fe(C_4H_4O_6)_2$, and *ammonio-tartrate of iron*, or *ferrum ammoniac tartras*, $(FeO)_2.(NH_4)_2.(C_4H_4O_6)_2$, although the latter is not included in the pharmacopœia, are excellent medicinal preparations of iron. For the method of preparing them, the reader is referred to Neligan's *Medicines*, 6th ed., p. 658, etc. They occur in the form of brilliant, semi-transparent, reddish-brown scales, and are soluble in about their own weight of water at $60^\circ F.$ *Potassium tartryl borate*, known also as *soluble tartar* (although the term has also been applied to tartrate of potash), or *soluble cream of tartar*, $K.BO.C_4H_4O_6$, has been employed medicinally, but is not now used. *Potassio antimonious tartrate*, known also as *tartarized antimony* and *tartar emetic*, $2K(SbO)C_4H_4O_6 + H_2O$, is one of the most valuable articles in the whole

Materia Medica. This salt, obtained by a process which is given in the pharmacopœia, occurs in the form of square prisms, which are soluble in about 15 parts of cold water and in 2 parts of boiling water. This salt is somewhat efflorescent, and when dried at 212° F. (100° C.) loses all its water of crystallization; its solution slightly reddens litmus, throws down an orange-colored sulphide of antimony, if a current of sulphureted hydrogen is passed through it, and has a very peculiar nauseous, metallic taste.

There is no very delicate test for tartaric acid. Its presence in a moderately strong solution may be detected by the addition of acetate of potash, when a sparingly soluble bitartrate is soon separated, especially if the mixture be well stirred. All the tartrates on charring emit a peculiar odor resembling that of burned sugar.

A remarkable metameric modification of tartaric acid is known as *racemic* or *paratartaric acid*, $C_4H_4O_6 + 2H_2O$. It is a frequent associate of tartaric acid, but is especially abundant in the grapes of the Vosges district. While in most respects it exhibits a close resemblance to tartaric acid (the two acids having the same composition, yielding, when exposed to heat, the same products, and their salts corresponding in the closest manner), it may be distinguished and separated from it by the following points of difference. It crystallizes more readily from solution; it contains two equivalents of water of crystallization; it is less soluble in alcohol; and the racemate of lime is soluble in hydrochloric acid, and is precipitated unchanged on adding ammonia. Its most important difference, however, is, that its solution does not rotate the plane of polarization, while a solution of ordinary tartaric acid exerts a well-marked right-handed rotation.

The brilliant researches of M. Pasteur on the optical and chemical properties of tartaric and racemic acids, have opened up a new and most important field of investigation in relation to the molecular composition of organic bodies. We shall give the briefest possible abstract of his remarkable discoveries, and must refer for fuller information to his numerous memoirs in the *Comptes Rendus*, *Annales de Chimie*, and other French scientific journals. He has proved that racemic acid is a mixture of ordinary tartaric acid (to which, from its optical property, he applies the term *dextro-racemic acid*) and of an acid which produces left-handed rotation, to which he gives the name *levo-racemic acid*. (These acids are also known as *dextro-tartaric* and *levo-tartaric acids*.) He found that, by saturating racemic acid with soda and ammonia, and allowing this solution to crystallize slowly, two varieties of crystals are obtained, which may be distinguished by their form, in the same way as the image and the reflection of the image in a mirror differ; or as right-handed and left-handed. If the two kinds of crystals are separated, and then dissolved, each solution is found to act powerfully on polarized light, but in opposite directions. On separating these acids from their bases, and mixing equal parts of concentrated solutions of each, racemic acid is again formed, which exerts no action on a polarized ray. M. Pasteur has subsequently made the discovery, that racemic acid may be artificially produced by the action of heat upon certain compounds of tartaric acid (such as tartrate of cinchonine or tartaric ether), which are capable of resisting a high temperature. The formation of racemic acid in this way is accompanied by the production of another modification of tartaric acid, which he calls *inactive tartaric acid*, which, like racemic acid, has no action on polarized light, but unlike it, cannot be resolved into dextro and levo-racemic acids.

Tartaric acid and the tartrates, in their relation to medicine, are of considerable importance. Pure *tartaric acid*, in small doses diluted largely with water, forms a good refrigerant drink in febrile and inflammatory affections, and is much employed for this purpose in hospitals, etc., as being cheaper than citric acid. It has been stated that persons addicted to habitual drunkenness have been reclaimed by the following treatment: A few crystals of the acid are dissolved in two small tumblers of water, and taken in the morning fasting, an hour intervening between the tumblers. The painful feeling of sinking and craving of the stomach, of which such persons usually complain, is said to be removed by these acid draughts. Under the name of *acidulated drops*, lozenges composed of this acid, sugar, and oil of lemons are largely employed in mild sore throats and colds. The principal medical use, however, of tartaric acid is in the preparation of effervescent draughts, when added to alkaline carbonates; and in the composition of seidlitz powders (q.v.). *Tartrate of potash* is a mild but efficient purgative in doses of from two to six drams, which is perhaps hardly so much used as it deserves. In passing through the system it becomes converted into carbonate, and thus renders the urine alkaline. *Acid tartrate*, or *bitartrate of potash*, commonly known as *cream of tartar*, in full doses, acts as a sharp purgative, but is generally prescribed with some of the milder vegetable cathartics. When administered in small repeated doses (from a scruple to a dram), in a large quantity of water, it largely increases the secretion of urine, and is consequently of great service in dropsy. It may be agreeably given in either of the following forms: (1) *Imperial*, which is prepared by dissolving a dram of cream of tartar in a pint of boiling water, and flavoring with lemon-peel and sugar. In incipient dropsy, a couple of tumblers of this mixture, with half a glass of good hollands

in each, are strongly recommended by Dr. Neligan as an after-dinner drink. The proportion of cream of tartar to the pint of water may be gradually increased to two drams.

(2) *Cream of tartar whey* is prepared by boiling 100 grains of the salt in a pint of new milk, and removing the curds by straining. Either of these drinks may be safely taken to any extent agreeable to the patient. *Tartrate of iron and potash*, the *ferrum tartaratum*, or *tartarated iron*, of the pharmacopœia, is a mild chalybeate tonic, which, in consequence of its somewhat sweet taste, is well adapted for children. It occurs in transparent scales of a deep garnet color, is soluble in water, and sparingly soluble in spirit. The dose varies from 5 grains to a scruple, three times a day, either given with honey or treacle, or dissolved in some aromatic water. The *wine of iron* (*vinum ferri* of the *Pharm. Brit.*) consists of sherry with tartarated iron in solution. Each dram ought to contain one grain of the salt. The *tartrate of iron and ammonia*, or *ammonio-tartrate of iron*, closely resembles in its action the tartrate of iron and potash. Although not in the *Pharm. Brit.*, it is "an excellent preparation of iron, void of all astringency. Its not disagreeable taste, its solubility in water, its compatibility with the alkaline carbonates, and the permanency of its composition, give it an advantage over most of the other preparations of iron. It is peculiarly suited as a tonic for those derangements of the uterine organs in which ferruginous salts are indicated."—Neligan's *Medicines*, 6th ed. p. 645. The dose is from 5 to 8 grains, and it may be prescribed in the form of powders, pills, or solution; or made into a bolus with honey. *Tartar emetic*, in doses of from $\frac{1}{15}$ to $\frac{1}{4}$ of a grain, frequently repeated, acts as a diaphoretic or sudorific; nausea sometimes accompanies the diaphoresis, but it has the advantage of increasing the tendency to perspiration. The addition of the compound tincture of lavender tends to prevent the supervention of vomiting. Tartar emetic in these small doses is of great service in febrile disorders, in the hæmoptysis of phthisis, in obstinate cutaneous diseases, etc. *Antimonial wine* consists of sherry holding tartar emetic in solution in the proportion of two grains to the ounce. The dose, to produce a diaphoretic action is 20 or 30 minims every hour. If we require an expectorant action—as in acute pneumonia or bronchitis—the salt should be given in still smaller doses, as from $\frac{1}{15}$ to $\frac{1}{12}$ of a grain. Tartar emetic, in doses of two or three grains, dissolved in water, acts as a powerful emetic, and at the same time produces much nausea and depression, and not unfrequently purging. The vomiting seldom occurs till about 20 minutes after the draught has been taken. If tartar emetic is thus given at the commencement of febrile or inflammatory affections, it will often cut short the impending disease. With this view it is employed in continued fever, croup, whooping-cough, etc. It used to be given to relax the muscular system, in cases of strangulated hernia and dislocation; but chloroform is far better for these objects. In cases of poisoning it is inferior to sulphate of zinc. It is expedient to take the emetic dose in parts, as too powerful an effect is thus prevented. Two grains, which are generally sufficient, must be dissolved in eight ounces of water, of which a quarter should be taken every ten minutes till vomiting ensues. The patient should walk gently about his room between the doses. If a large dose (of one, two, or even three grains) be repeated every second hour, the nausea, vomiting, and purging (which often follows a full dose) cease after two or three such doses, and the main action seems to be exerted in depressing the circulation and lowering the pulse. Hence, tartar emetic given in this way is a direct sedative or contra-stimulant, and is of great service in pneumonia and pleurisy. "As a contra-stimulant," says Neligan, "tartar emetic is given in doses of from half a grain to two grains every hour or second hour, dissolved in one or at most two ounces of orange-flower water. The first dose or two should not exceed half a grain, and the patient should not be permitted to drink, so as, if possible, to avoid the production of vomiting. When once a tolerance of the medicine is produced in the system, the quantity taken may be rapidly increased."—*Op. cit.*, p. 418. Lastly, tartar emetic, when applied to the skin, produces a crop of pustules, which ulcerate, and discharge purulent matter. In consequence of this property, tartar emetic, either in the form of ointment or of saturated solution, is often employed as a counter-irritant in various affections of the viscera of the chest and abdomen, in diseases of the joints, etc. The *ointment* is applied by rubbing about half a dram on the skin night and morning. In two or three days pustules begin to appear, when the further application of the ointment should be temporarily suspended. The saturated solution is a cleaner preparation than the ointment, and acts more speedily. It is applied by means of pledgets of lint soaked in it. Tartar emetic, in excessive doses, or in small repeated doses, acts as an irritant poison. Dr. Taylor has reported 37 cases of poisoning by this agent, of which 16 were fatal. The smallest fatal dose was in a child *three-quarters of a grain*, and in an adult *two grains*, but in the last case there were circumstances which favored the fatal action of the poison. The symptoms occurring in chronic poisoning by this salt are "great nausea, vomiting of mucus and liquids, great depression, watery purging, followed often by constipation of the bowels, small, contracted, and frequent pulse, loss of voice and muscular strength, coldness of the skin, with clammy perspiration, and death from complete exhaustion." A considerable number of cases are on record in this country in which murder has been perpetrated by the slow action of tartar emetic. The most important of them are referred to by Dr. Taylor in his *Medical Jurisprudence*, pp. 146 and 250, to which must be added the Pritchard case in Glasgow, 1865. The *Pharmaceutical Journal* for Oct., 1865, contains direc-

tions, by Messrs. T. and H. Smith, of Edinburgh, for preparing an antidote to be prescribed after a large dose of tartar emetic has been taken. The ingredients are solution of perchloride of iron and calcined magnesia.

TARTARS, or, more properly, **TATARS**, was originally a name of the Mongolic races, but came to be extended to all the tribes brought under Mongolic sway by Genghis Khan and his successors, including Tungusic and Turkic races. The term is therefore not to be considered as ethnological, though all, or almost all, the peoples included under it, in its widest sense, belong to the Turanian family, but is rather to be understood in the same sense as the term "Franks" used by Mohammedans. In the classification of languages, Tartaric has become the distinctive name of that class of Turanian languages of which the Turkish is the most prominent member, while the Mongolic form a separate class. See **TURANIAN LANGUAGES**; see *illus.*, **ETHNOLOGY**, vol. V.

TARTARUS (Gr. *Tartaros*; the name is probably onomatopœic, the reduplication being designed to express something terrible or disagreeable, like *Barbaros*, *Karkaron*, and many other words), according to Homer, is a deep and sunless abyss, as far below Hades as earth is below heaven, and closed in by iron gates. Into Tartarus, Zeus hurled those who rebelled against his authority, as e.g., Kronos and the Titans. Afterward the name was employed sometimes as synonymous with Hades or the under-world generally, but more frequently to denote the place where the wicked were punished after death—lowest hell, in fact. A noticeable feature about these punishments is their congruity with the nature of the offenses perpetrated. See **HEAVEN** and **HELL**.

TARTARY (properly **TATARY**) is the name under which, in the middle ages, was comprised the whole central belt of central Asia and eastern Europe, from the sea of Japan to the Dnieper, including Mantchuria, Mongolia, Chinese Turkestan, Independent Turkestan, the Kalmuck and Kirghis steppes, and the old khanates of Kasan, Astrakhan, and the Crimea, and even the Cossack countries; and hence arose a distinction of Tartary into European and Asiatic. But latterly the name Tartary had a much more limited signification, including only that tract bounded on the n. by Siberia, and on the s. by China and Thibet, along with Independent Turkestan; and at the present day, many writers apply it as a synonym for Turkistan (q. v.).

TARTINI, GIUSEPPE, 1692-1770; b. Pirano, Italy; received lessons in music, violin-playing, and fencing; studied law; married privately at Padua, and to avoid arrest by the bishop fled to a convent, where for two years he gave himself to the study of the violin, receiving lessons in composition from father Boemo, the organist of the convent; appointed chief violinist of the chapel of St. Anthony at Padua, 1721; established, 1728, at Padua a violin school of great celebrity. He left in MS. 48 violin sonatas, 1 trio, 127 concertos, besides his published works. *Sonate du Diable, or Tartini's Dream*, he considered his best composition.

TARTREALIC ACID and **TARTRELIC ACID**. See **TARTARIC ACID**.

TARTUFE, the name of the chief character in Molière's most celebrated comedy, which has become a synonym in all languages for a hypocritical pretender to religion. The original of the character was most probably a certain Abbé de Roquette, a parasite of the prince de Conti. The name is said to have suggested itself to Molière on the occasion of a visit to the papal nuncio, where he saw the pious and solemn countenances of the nuncio's courtiers suddenly lighted up with ecstatic animation by the appearance of a seller of truffles—in Italian, *tartuffoli*. This play excited a greater commotion than perhaps any other production of the kind ever did. It was written in 1664; but before it was brought on the public stage, partial representations of it in private companies had made its character known, and raised the alarm of the priests, who believed themselves to be specially satirized therein. Uniting with the many enemies whom Molière had already made for himself by lashing physicians, fops, and fools of all kinds, they used every means in their power to prevent the public representation of the play. The archbishop of Paris threatened with excommunication all actors who should take any part in the performance, and even those who should only read it; and one dignitary went so far as to declare that Molière—whom he called a devil in human form—was deserving of the stake. It was not till 1669 that Molière succeeded in getting the play publicly acted in presence of Louis XIV.; and then it had an uninterrupted run for three months, to the great vexation of all hypocrites.

TARUDANT, a city in the province of Sus, Morocco; about 2 m. from the Sus river, and 125 m. s.w. from Morocco; pop. about 8500. It is walled and defended by a citadel. Most of the houses have but one story, and the streets are narrow and crooked. The city is surrounded by a highly cultivated country, and itself contains many groves and gardens. Its chief manufactures are of copper, leather, and dyes.

TASCHEREAU, ELZÉAR ALEXANDRE, b. Quebec, 1820; educated at the Quebec seminary. He entered the Roman Catholic priesthood in 1842; was for some time professor of mental philosophy, and superior in the Quebec seminary, and became professor of canon law at Laval university in 1856. He became administrator of the Quebec diocese in 1870, archbishop of Quebec in 1871, and cardinal in 1886.

TASHKEND, till recently a t. of Independent Turkistan, but now in the possession of Russia, and capital of Russian Turkistan, is situated in the valley of the Tschirtehlík, in lat. 41° 20' n., long. 69° 20' e. It is the chief commercial town in the district, is the center of the transit-trade between Bokhara, Khokan, and Chinese Tartary, and has extensive trading relations with Orenburg and Petropavlovsk. Like most of the cities of central Asia, it stands in a fertile plain. It covers a large tract of ground, being said to extend 10 m. in one direction and 5 in another, and is protected by a high wall of sun-dried bricks. Within the walls are numerous gardens and vineyards, interspersed among the houses; the houses themselves are built of mud, and thatched with reeds. The streets are narrow and dirty. The chief buildings are the castle (which is fortified), various mosques, colleges, old temples, and a bazaar. The chief manufactures are gunpowder, silk and cotton goods, and iron. According to a census taken in 1887, the pop. amounted to 156,506. Tashkend is also important in a military point of view, and, mainly for this reason, had been long coveted by Russia. The Russians, who captured it in 1854, and retained it for a short time, finally took possession of it in 1865, having in the mean time made great advances in central Asia. The petition of the inhabitants, that they might be received as Russian subjects, was granted in 1866; and since then it has been governed by a kind of municipal board, the president being a Russian officer, and the members chosen by the townspeople. The trade is important, the value of foreign goods exchanged here amounting to upwards of \$20,000,000 annually.

TASMAN, ABEL JANSZON, b. Hoorn, n. Holland, about 1600; was sent, 1642, by Van Diemen, governor-general of the Dutch East India company, to explore New Holland, and on Nov. 24 discovered the island which he called Van Diemen's Land (now Tasmania). After a voyage of 10 months, in which he discovered New Zealand, the islands of the Three Kings, the Friendly, and Feejee islands, he returned to Batavia. He made a second voyage to New Guinea and New Holland, 1644. He published an account of his first voyage. He died in Batavia in 1659. His life was written by Dozy in his *Bijdragen tot de taal-, land-, en volkenkunde van Nederlandsch Indie* (1887).

TASMANIA, formerly VAN DIEMEN'S LAND, a considerable island in the South Pacific ocean, between the parallels of 40° 33' to 43° 39' s. lat., and between 144° 39' to 148° 33' e. long., lying to the s. of, and separated from, Australia by Bass's strait. Its greatest length, from cape Grim on the n.w., to cape Pillar on the s.e., is 240 m.; and its greatest breadth from e. to w., 200 m.; its area, including the adjacent islands, about 26,215 sq. miles. The capital is Hobart Town, with a pop. (1891) of 24,905, situated at the base of Mt. Wellington, on the western shore of the estuary of the river Derwent. The second chief town is Launceston, with a pop. of 17,208, situated at the head of the estuary of the Tamar, formed by the junction of the North and South Esk rivers. In the year 1854 the population consisted of—males, 30,613; females, 28,261; total, 64,874. In 1874, males, 55,117; females, 49,059; total, 104,176. Total pop. in 1893, 154,424. Hobart Town and Launceston are connected by the electric telegraph, and by an excellent macadamized road, 121 m. in length, from which good roads branch off. In 1895 there were 1789 m. of telegraph. The first line of railway, 45 m. in length, was opened in 1871, uniting Launceston with Deloraine; there are in all (1895) 475 m. of railway.

Physical Features.—The south-eastern coast of Tasmania is deeply indented by the estuaries of the Derwent and Huon, Storm bay, the inlet of Pitt Water, and Frederick Henry bay. The last is protected on the s.e. by Tasman's peninsula, reserved as a penal settlement for the colony. The chief indentations on the w. coast are Macquarie harbor (formerly a penal settlement, but now uninhabited), and Port Davey. On the e. coast are Oyster bay, between Freycinet's peninsula and the mainland; and Spring bay, sheltered on the e. by Maria island. On the n. coast, besides the estuary of the Tamar, there are numerous smaller harbors and rivers, accessible to vessels of from 30 to 300 tons. The chief of these are Circular Head, Port Sorell, and the rivers Mersey, Forth, Leven, Don, and Inglis. The scenery is of a bold mountainous character, varied by deep narrow valleys, extensive undulating tracts of country, and open plains of limited extent. Among the principal mountains are Ben Lomond (5020 ft.). Cradle Mount (5069 ft.), Ironstone Mount (4736 ft.), Mt. Barrow (4644 ft.), Mt. Wellington (4170 ft.), with many others exceeding 4,000 ft. in height. Embosomed among the central mountains, at an average height of about 3,000 ft., are numerous lakes, with a united area of about 170 sq.m., which feed the greater part of the rivers draining the s.e. slope of the island. With the exception of the reclaimed lands, the basaltic plains, and limited tracts which are unfavorable to the growth of timber trees, the whole island is more or less densely wooded. The vast forests of the western portions of the n. and s. coasts are extensively utilized for timber, and in the former, the work of reclaiming the rich heavily-timbered lands is rapidly progressing. But the major part of the western half of the island is entirely uninhabited, its soil, climate, and inaccessible position offering little inducement to the settler.

Geology and Mineralogy.—The bed-rocks of the western districts, from Bass's strait to South-west cape, consist of vast bands of slates, schists, and quartz rock, belonging to the azoic or metamorphic series. Next to these come lower paleozoic slates, with conglomerates and dark compact limestones, the latter highly charged with Silurian fossils. Unconformably upon the upturned edges of these rocks lie upper paleozoic sandstones, mudstones, limestones, and conglomerates, also traversed by dikes and masses of green-

stone and basalt, and with these, reaching an altitude of 4,000 ft. above the sea-level. In the s.e. districts, from the South Esk river on the n. to the Huon on the s.w., the lower rocks are entirely absent, or concealed beneath the upper paleozoic beds. In the n.e. district, the lower rocks again make their appearance, associated with granite and greenstone, and occasionally traversed by dikes and veins of the true auriferous quartz. Here, again, they are overlaid by upper paleozoic rocks, extensively denuded, and exposing seams of coal from 2 ft. to 14 ft. thick, at various elevations. Tertiary rocks are sparingly distributed. At the mouth of the river Inglis, on the n. coast, are beds of a whitish freestone, attaining in places a thickness of 120 ft., and containing recent shells, with extinct species of *trigonia*, *terebratula*, *cypræa*, *voluta*, etc. Tertiary lignites are found in the sandy clays of the valleys of the Derwent and Tamar, with impressions of leaves of unknown trees and plants. Over the greater part of the basin of the South Esk, comprising an area of more than 1000 sq.m., extensive deposits of clays, sands, and quartz drift are met with. No distinct traces of glacial action have been observed; but the thick beds of gravel, and the boulders, which must have traveled many miles from their parent rock, afford evidence of some powerful transporting agency, and were probably deposited in their present sites by the action of icebergs slowly drifting northward at some period prior to the last general elevation of the land.

The igneous rocks are everywhere present in great variety. The islands of the Furneaux group in Bass's strait are chiefly of granite, and form the connecting links which join the n.e. angle of Tasmania to the great dividing range of eastern Australia. Gold has been found in many places, and the workings have for years given fair returns to a limited number of miners. In 1895 the value of the gold produced was £2,960,344. Silver and antimony have been occasionally met with in the gold drifts, and very rich deposits of tin have begun to be worked at Mount Bischoff. In 1892, £256,083 worth of tin ore was produced. Copper occurs in thin veins, associated with galena, on the n. coast, near the river Leven, and galena has been found elsewhere in the primitive limestones. Red and brown hematites, containing a large percentage of iron, occur at various points on the n. coast, in large masses and lodes. Iron-works on an extended scale are now in operation. Coal is worked in several parts of the island, chiefly for local consumption. A large lode of bismuth was discovered in 1875. The older limestones yield fine varieties of marble, and excellent building stone is obtained from the greenstones, basalts, and paleozoic sandstones. Silver to the value of £158,859 was exported in 1893. Valuable deposits of zircons, allied with other gems and rare earths, have been discovered on the n.w. coast.

Botany.—The flora of Tasmania has been fully described in the botany of the antarctic voyages by Hooker and others. The majority of the species are common to Australia and Tasmania. Of those which are peculiar to the latter, many are limited to particular localities. The most widely diffused genera are the eucalypti and acaciæ, the former yielding the ordinary timber of the colony. The blue gum (*eucalyptus globulus*) reaches a height of 350 ft., with a corresponding girth. The blackwood (*acacia melanoxylon*) and the huon pine (*dacrydium franklinii*) also yield valuable timber, which, together with the hardwoods from the eucalypti, is largely exported to the neighboring colonies. A species of beech *fagus Cunninghamii*, locally known as the myrtle, and growing in great abundance in some parts of the island, also produces a highly valuable timber, which has not yet received the attention which it merits. There are many beautiful shrubs and plants, but the flowers are usually small and inconspicuous. All the common fruit-trees and culinary vegetables of England have been introduced, and grow with great luxuriance and vigor. Oranges and lemons are cultivated in some situations, but do not usually ripen their fruit. The introduction and cultivation of exotic trees and plants is energetically carried on in the botanical gardens under the direction of the Royal Society.

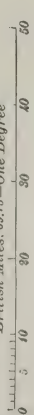
Zoology.—Of the 30 species of mammals, one-half belong to the sub-class *aplacentalia*, comprising the *marsupialia* (kangaroo, wallaby, opossum, wombat, etc.), and two species of the singular order *monotremata* (ornithorhynchus and echidna). Among the marsupial animals peculiar to Tasmania, the chief are the thylacine (*thylacinus cynocephalus*) and the Tasmanian devil (*dasyurus ursinus*), both of which are sometimes very destructive to sheep in the outlying districts. The skin of the kangaroo is much prized for leather, and there is always a market for opossum fur. Whales and seals, formerly very abundant on the coasts, are now rare; but whaling is still extensively carried on in the adjacent seas. The birds of Tasmania have been admirably described by Gould. The majority are identical with Australian species. The emu is extinct, and black swans are seldom seen in the settled districts. There is abundance of native game, which is now protected by act of parliament during the breeding season. A species of puffin (*Puffinus brevicaudus*), locally known as the mutton-bird, frequents some of the islands in Bass's strait in countless numbers, and many thousands are annually slaughtered for the sake of their oil, and for food by the half-caste islanders. Fish are plentiful in the seas and rivers, the best being known by the local name of trumpeter, and reaching a weight of 40 lbs. There are 13 species of snakes, most of which are venomous, but accidents from their bite are of very rare occurrence. Many species of insects and crustaceans have been described by Erichson, Gray, Gunther, and others. A comprehensive and accurate account of the *fauna* of Tasmania is still however, a desideratum.





TASMANIA

British Miles, 62.15=One Degree



Railroads thus

145 Longitude East from Greenwich 147 148

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Fallow-deer, and several of the English game-birds, have long been naturalized, and salmon have been introduced after several unsuccessful attempts.

Climate, Soil, Produce, etc.—The climate of Tasmania is fine and salubrious. From observations taken at Hobart Town, and extending over a period of twenty years, the extreme of heat appears to be 105° , and of cold $29^{\circ} 8'$. The mean temperature of the hottest month (January) is $63^{\circ} 57'$, and of the coldest (July), $45^{\circ} 82'$, and of the whole year, $54^{\circ} 92'$. In some parts of the island, the temperature, even in winter, rarely sinks to 45° . Snow seldom falls in the settled districts, and does not lie on the ground except on the high table-lands of the interior. The average annual rain-fall at Hobart Town is 23 inches, and the average for the rest of the island about 35 in., except in the western country and the high lands, where a fall of 75 in. has been registered in the year.

The agricultural lands may be divided into three classes—alluvial deposits, tertiary clays, and loamy soils, derived from the decomposition of different kinds of basalt. In their virgin state, some are marvelously productive. On new land, 100 bushels of oats, 70 bushels of wheat, and 15 tons of potatoes per acre, are not uncommon crops. The fertility of the soil has encouraged a system of slovenly farming. In many instances, the land has been cropped with wheat and oats for upward of thirty years without any application of manure, or any rest save an occasional summer fallow. The export trade in the staple articles of produce has much fallen off of late years, partly because the neighboring colonies have begun to depend more upon their own resources, but partly also through the deterioration of the soil from improvident management, and the necessarily increased cost of production. There are skilled and careful farmers in every district, but they are exceptions to the rule. The open pastoral lands are admirably adapted for sheep. The wool from some of the larger establishments is much valued, and brings the highest price in the London market. The cattle and agricultural horses of some of the northern districts are unsurpassed in the colonies. Pastoral and agricultural associations have been formed to promote improvements in the system of farming, and to encourage the breeding and importation of pure stock. The total area of the colony is 16,778,000 acres, of which 10,860,426 is unalienated land. In 1895 there were 212,703 acres under crop. In 1896 the number of horses in the colony was 31,580, of cattle 162,801, and of sheep 1,523,846. In 1895 the exports amounted to £1,373,063, the chief staple article being wool; the imports were £1,094,457. In 1896 the yield of wheat was 1,164,855 bushels; oats, 906,934 bushels; potatoes, 81,243 tons; hay, 62,345 tons.

Administration.—Since the passing of the "constitutional act" in 1854, the governing authority has been vested in a parliament, consisting of the governor as the queen's representative, and two elective houses, the legislative council of 18, and the assembly of 37 members. The qualification of voters is, for the former, a freehold of any value of £20, or a leasehold of £80, and for the latter to possess property or have an income of £60 per annum. Graduates of British universities, and all holding a commission in the army or navy, or in holy orders, are entitled, *ex officio*, to vote at the election of members of both houses. The public debt of Tasmania on Dec. 31, 1895, amounted to £8,180,925 and consisted chiefly of 4% debentures. The greater part of the revenue, namely about 60%, was derived from the taxes, chiefly from the heavy customs duties, amounting in 1895 to about 28% of the value of the imports. The next in importance is the revenue from railways, posts, telegraphs and other public services; the rest comes chiefly from the crown lands. The chief item of expenditure was the interest on the public debt, which amounted to 43% of the total expenditure. The next item in importance was special public works, amounting to 31% of the total expenditure. The revenue for the year 1895 was £761,971. The expenditure for the year 1895 was £748,946. The upset price of land is £1 per acre, payable by installments extending over eight years; but lots which remain unsold after being offered for sale by public auction may be purchased, under certain restrictions, at greatly reduced rates. In the unsettled districts, large tracts of land are obtainable at nominal prices. In 1862 an act, known as "Torrens's real property act," was passed to facilitate the transfer and conveyance of land. Property which had been brought under the operation of this act can be conveyed, without reference to value, upon payment of 16s. registration-fee, £1 for new certificate of title, and 2s. for forms. Mortgages can be effected on equally moderate terms.

Religion and Education.—Until a recent period, £15,000 was annually reserved for the support of religion, and this sum was divided among the various religious denominations according to their respective numbers at the census. By a return in 1891 there were: Church of England, 76,082; Roman Catholics, 25,805; Presbyterians, 9756; Wesleyans, 17,150; Independents, 4501; Baptists, 3285; Jews, 84. The state grants are largely supplemented by endowments and by local contributions. In 1895 the government paid £35,501 to the cause of education. The system is based upon the principles established by the Irish national board. The teachers are appointed by the board, and are under the supervision of the inspector of schools. In 1854, the total number of schools was 50, at which the average attendance of pupils was 2624. In the beginning of 1895 there were upward of 260 schools supported by the government, and 19,907 children on the rolls. Education in Tasmania is compulsory. In 1891, 37,034 persons (or 25.4%) of the population could neither read nor write.

For the promotion of higher education, provision is also made by the legislature. Two scholarships, each of the value of £200 a year, and tenable for four years at either of the English universities, are annually open to competition under the direction of the

council of education, and exhibitions to the higher schools, with other local honors, are periodically awarded by the same body.

Aborigines.—The number of the aborigines at the first colonization of Tasmania has been variously estimated, but probably at no time exceeded 3,000. There were several tribes occupying distinct parts of the island, and differing from each other in dialect and customs; but of a generally uniform type more nearly allied to the Negritos of New Guinea than to the aborigines of Australia. The average height of the men was from 4½ to 5½ ft.; of the women, considerably less. Color, a bluish black; the facial angle 75° to 80°; eyes, dark brown, with jet-black pupils; hair, sometimes lank, but generally crisp or woolly; forehead, high and narrow; limbs, lean and muscular; feet, flat and turned inward. Polygamy appears to have been tolerated: the women performed all menial duties, and were specially charged with that of carrying fire from place to place, when the temporary encampment was broken up. Their usual shelter was a "break-wind," constructed of boughs, but traces of rude huts have been observed. In summer, they went entirely naked, at other times wearing coverings made from the skins of the kangaroo and opossum, which formed their chief food. The coast tribes, at certain times of the year, lived almost exclusively on shell-fish, and the remains of their feasts have often been mistaken for recent marine deposits. Among other articles of food were the roots of the esculent fern, the heart of the tree-fern, and grass-tree (*xanthorrhæa*), the seeds of the boobialla (*acacia sophora*), and a singular fungus (*myliitta Australis*), commonly known as "native bread," which grows under ground near the roots of decayed trees. No traces of cannibalism were observed. Their only weapons were the spear and waddy, a wooden club about 2 ft. 4 in. in length. The early relations between the settlers and aborigines were friendly; but as the latter were gradually dispossessed of their favorite hunting grounds, they became inveterately hostile. Shot down without mercy by the settlers, they revenged themselves by bloody reprisals, and for many years the unequal struggle continued, until their numbers were reduced to a few hundreds. In 1830, an attempt was made to drive the whole body into Tasman's peninsula, by means of a cordon extending across the whole island, and gradually closing in toward the s.e.; but it failed ridiculously, as might have been foreseen. In the following year, Robinson, a builder of Hobart Town, undertook to conciliate the surviving remnants of the various tribes, with a view to their removal to Flinders island, and this he successfully accomplished, after four or five years of patient, self-denying labor. In spite of all the care bestowed upon these unfortunate people their numbers rapidly decreased, and only 45 remained when the settlement was removed, in 1847, to a more convenient station at Oyster cove, near Hobart Town. There were in 1865 only six remaining. No children had been born among them for many years, and the race is now wholly extinct, the last of the number having died a few years ago.

History.—The island was first discovered by Tasman on Nov. 24, 1642, and named by him Van Diemen's Land, in honor of his patron, the then governor of the Dutch possessions in the East Indies. During the next century, no visit is recorded; but between 1772 and 1802, partial surveys and explorations were made by English and French navigators. In 1803, Lieut. Bowen was dispatched from Sydney with a few soldiers and convicts to form a settlement in the s. of Tasmania, which was finally fixed on the spot where Hobart Town now stands. In 1804, a settlement was formed near the mouth of the Tamar, which was removed in 1806 to the spot now occupied by the town of Launceston. From 1817, commenced a rapid increase in the number of free settlers, who received grants of land in proportion to the capital which they brought into the colony, and were subsequently further aided in the clearing and cultivation of their estates by the assignment of convicts as their servants. In 1825, Tasmania was declared independent of New South Wales.

The colony was for a good many years agitated by the question of the disposal and management of the convicts, who were now becoming a prominent and formidable element in the community. At last, in 1853, transportation to Tasmania and New South Wales was finally abandoned by the home government. The abolition of transportation, and the consequent cessation of a vast imperial expenditure, naturally produced a considerable depression in all branches of trade, especially in the southern districts. It is not surprising that the great body of the colonists, instead of setting themselves manfully to turn the true and natural resources of the country to the best account, have rather looked for some great discovery of rich gold-fields, or some gigantic works undertaken under the auspices of government, as the only means by which the prosperity of the colony was to be assured. But such a state of things must ultimately work its own cure. Viewed in a true light, the progress, social, material, and political, has presented a more hopeful aspect since the extinction of the convict system than at any earlier period. For years after the discovery of gold in Australia, the *expirees* of Tasmania flocked in crowds to the neighboring colonies, attracted by the prospect of richer gains, and glad to escape from police surveillance in a country where their antecedents were too well known. Those who remained had, for the most part, by this time become orderly, well-conducted members of the community, not to be distinguished from the immigrant population by whom they were surrounded. Necessity will in due time develop the enterprise and energy which have too long lain dormant. Some of the older settlements may prove inadequate to the maintenance of their former

population, but the rich lands of the n. coast offer to industrious settlers a field which is practically inexhaustible. For type of people, see illus., AUSTRALIA AND TASMANIA, vol. II.

TASMAN NIA, a genus of shrubs of the natural order *magnoliaceæ*. *T. aromatica* is an evergreen bush of Van Dieman's land, growing in the richest soils on the margins of rivers and in shady ravines, and sometimes forming thickets of large extent. Every part of the plant is highly aromatic and pungent. The fruit is occasionally used as pepper.

TASSAERT, NICOLAS FRANÇOIS OCTAVE, 1800-74; b. France; studied art at the Paris school of art and under eminent masters of painting. His first picture was exhibited in 1831. His field was wide, including historical and *genre* pieces as well as portrait-painting. Among his best productions are "Le Marchand d'Esclaves;" "Le Sommeil de l'Enfant Jésus;" and "Funérailles de Dagobert à Saint Denis."

TASSIN, A. G., b. France, 1843; educated at the St. Cyr military school of France; was appointed 1st lieu. 35th Ind. vols., 1861; capt., 1863; maj., 1864; col., 1865; brevetted brig.gen. and maj.gen. for gallantry. He resigned to accept commission in the French army during the Franco-Prussian war; was made knight of the legion of honor. He was afterward reappointed by Pres. Grant, as colonel in the U. S. army. He was author of *Northern California Indians*; *The Indian Tribes of the Pacific Coast*; *The Flora of Arizona*; and translations of military works.

TASSISUDON, the summer capital of Bhotan (q. v.), stands on the right bank of the Godadda, an affluent of the Brahmaputra, 15 m. w. of Punakha. Many of the inhabitants, the number of whom has not been ascertained, are employed in manufacturing paper, and in making brass images and ornaments for their places of worship.

TASSO, BERNARDO, an Italian poet of considerable distinction, but most famous as the father of the illustrious Torquato, was b. at Bergamo, Nov. 11, 1493. Both by his father's and mother's side he was connected with the ancient family of the Tassi, known in the 13th c. for having organized and superintended the postal service in Italy, Spain, and Germany. His uncle, Luigi Alessandro, bishop of Recanati, took charge of his education, and under his care he turned out a fine classical scholar, his love of poetry at the same time becoming every year more ardent. The assassination of the cardinal in 1520, deprived him at once of protection and support, and for several years he wandered about Italy in a rather necessitous condition. Like his son, he was exceedingly fond of the patronage of noble lords and the smiles of noble ladies. After 1525 we find him high in favor with persons of influence. Guido Rangone, general of the papal forces, intrusted him with several missions, among others to the prince of Salerno, who appointed him his secretary; and Tasso accompanied the prince on the expedition against Tunis in 1534. In 1536 he married, at Salerno, a young lady of Sorrento, Porzia de' Rossi, who added genuine merit to the advantages of birth, beauty, and fortune, and by whom he became the father of Torquato. The fall of the prince of Salerno (who had incurred the enmity of Charles V.) brought with it the ruin of Tasso's worldly prosperity, and he was obliged to seek for a new patron. He was not long in finding friends. Guidubaldo, duke of Urbino, and Guglielmo, duke of Mantua, strove for the honor of attaching the poet to their court. The latter succeeded, and named him governor of the city of Ostiglia, where he died Sept. 4, 1569.

Tasso's principal writings, chronologically arranged, are: *Rime* (Ven. 1531); *I tre Libri degli Amori* (Ven. 1537); *Ode e Salmi* (Ven. 1560); *L'Amadigi*, *Poema* (Ven. 1560); and *Il Floridante*, *Poema* (Mant. 1587). Of these the principal is *L'Amadigi* (Amadis), which some Italian critics have not hesitated to place above the poem of Ariosto; but without adopting this extravagant estimate, we may justly admire it for the sweetness and elegance of its language, and for the beauty of its descriptions and comparisons.—For a good idea of the politics and literature of the time, see Seghezzi's edition of his *Letters* (3 vols., Padua, 1733-51), to which there is prefixed a biographical notice.

TASSO, TORQUATO, one of the greatest poets of Italy, was the son of the preceding, and was born at Sorrento in Naples, Mar. 11, 1544. His earliest education was received from the Jesuits. During his childhood, Tasso's father was an exile, but the affectionate solicitude of his mother well supplied the want of paternal care. In 1554 he went to Rome to join his father, and left his mother (whom he was destined never again to see) in a convent at Naples. At Rome, and subsequently at Bergamo, Urbino, Pesaro, and Venice, he continued to prosecute his studies. He assisted his father in copying, correcting, and even in completing his poem *L'Amadigi*, though as yet only 16 years of age. No wonder old Bernardo was delighted at the promise shown by his son, and prophesied in his letters that Torquato would yet become a great man. Later, however, sad experience of the miseries of a poet's life induced him to send Tasso to Padua, to study jurisprudence under the celebrated Panciroli. But whom the gods have made poetical can never sink into a lawyer. The youth remained at Padua a year, and wrote *Rinaldo* (Venice, 1562), a poem in 12 cantos, the hero of which is the son of Aymon, and cousin of Roland. It belongs, therefore, to the class of heroic romances. After the first burst of anger was over, Bernardo forgave his son for following his example rather than his precept, and became prouder of Tasso's genius than ever. Tasso now betook himself to the university of Bologna, to study philosophy, and is said to have distinguished himself

by an extraordinary facility in the discussion of the most elevated and abstract themes—a circumstance that perhaps says more for his power of rhetoric than his power of speculation. On leaving Bologna, he spent some time with friends at Castelvetro, Modena, and Corregio, but returned to Padua at the request of his friend Scipio de Gonzaga, afterward cardinal, who had established a literary academy there, of which Tasso became a member. It was during this second residence at Padua that he conceived the first idea of his great work, the *Gerusalemme Liberata*, a heroic record of the conquest of Jerusalem by the crusaders under the command of Godfrey de Bouillon. Lamartine beautifully describes the mingled motives of the poet: “Urged by piety no less than by the muse, Tasso dreamed of a crusade of poetic genius, aspiring to equal by the glory and the sanctity of his songs, the crusaders of the lance he was about to celebrate.” The same critic goes on to observe, in allusion to the less noble passion for the applause of courts that marked the poet: “The names of all the noble and sovereign families of the west would be revived in this epic catalogue of their exploits, and would attract to the author the recognition and favor of the great. . . . Finally, the poet was himself a knight, noble blood flowed in his veins, to celebrate warlike deeds seemed, as it were, to be associating his name with those of the heroes who had performed them on the field of battle: thus religion, chivalry, poetry, the glory of heaven and earth, the hope of eternal fame, all combined to urge him to the undertaking.” Bernardo heard of his son’s design with exulting joy, and blessed heaven for making Torquato a greater genius than himself. Meanwhile (1565), Tasso had been introduced by cardinal Luigi d’Este (to whom he had dedicated the *Rinaldo*) to his brother, Alfonso II., sovereign duke of Ferrara. Here for a time he was supremely happy. Young, handsome, courteous, and with that proper tinge of melancholy in his disposition that possesses an irresistible charm for women, he soon became a universal favorite with the beauties of the court. While their bright eyes rained influence, Tasso painted his *Armida* and *Herminia* almost without effort. It is only just to add that the attempt to seek the origin of his subsequent miseries and madness in a presumptuous passion for Leonora, sister of the duke of Este, which was first encouraged, then repulsed, and finally punished with imprisonment, is utterly at variance with the notorious facts of the case. Space does not permit us to examine the question here, but it appears necessary to correct errors of traditions so specious as to have imposed upon illustrious men. Tasso courted, platonically and otherwise, various ladies of the court—a pretty chambermaid even was not beneath his notice; but there is not a vestige of evidence to show that he lifted his eyes to the sister of his sovereign, or that such a suspicion was ever harbored by the lady herself or her brother. In truth, his madness was connected in its origin more closely with his poetry than with his loves. Having finished his great epic about 1575, he sent a copy of it to a society of scholars, critics, and churchmen at Rome, to get their opinion of it. It would have been far better had he published the poem at once, without placing it at the mercy of critics who were delighted to have the opportunity of finding fault before the public was in a position to praise. The critics would then have been forced to swell the chorus of general admiration. Tasso was tortured by their waspish comments, and, with pitiable agonies, proceeded to make his work more agreeable to his incapable judges. Gradually a morbid melancholy overpowered his reason; the spites and jealousies that are never absent from a gay and pleasure-loving court contributed to increase his mental disorder. He believed that invisible persecutors had denounced him to the inquisition as a heretic. It was in vain that Alfonso and his sisters tried to calm the perturbations of his spirit, and even got the inquisition to write him a reassuring epistle. His paroxysms increased in violence. Finally one evening (June 17, 1577), he drew his dagger in the apartments of the duchess of Urbino, to stab a domestic whom he conceived to be one of his secret enemies; whereupon Alfonso had him confined in his palace and at Belignardo for his health’s sake, rather than to punish him. On July 20 he made his escape, and fled across the Abruzzi to his birthplace, Sorrento, where he took refuge with his sister. The air of his native place quickly restored him to health; but no sooner had he recovered than he began to yearn for the old excitements, begged Alfonso to take him back, and when that prince drily informed him that he might return if he pleased, Tasso greedily availed himself of the cold permission, and was soon as wretched as before. A new flight ensued, this time toward the north of Italy. The unhappy poet wandered at last half-naked into the city of Turin, where he was humanely received by the marquis d’Este, brother of Alfonso. After some time, he again ventured to return to Ferrara, Feb. 21, 1579, but only to madden, almost as soon as he breathed its noxious air. Alfonso was again obliged to put him under constraint, in which he remained upward of seven years, when the duke, at the request of several of his brother sovereigns, released him (July 5, 1586). During the remainder of his life Tasso lived chiefly at Naples. Almost the last incident of his career was his visit to Rome to receive (like Petrarch) the honor of a public coronation on the Capitol. The excitement was too much for his ruined frame. A slow fever seized him; he was removed to the convent of Santo Onotrio, on the Janiculum, and there, before the laurel could be conferred, died, April 25, 1595, after a brief illness. It should be noted that in 1570, T. visited France, where he spent a year, gaining the friendship of Charles IX. See Black, *Life of T.* (Edinb. 1810); Ebert, *T. Tasso’s Leben* (Leip. 1819); Zuccala, *Della Vita di Tasso* (Mil. 1819); Milman, *Life of T. Tasso* (Lond. 1850); Cibrario, *Degli Amori e Della Prigione di Tasso* (Tur. 1862).

Besides his *Gerusalemme Liberata*, Tasso wrote a great number of works in verse and prose, among which may be mentioned *Rime, insieme con altri Componimenti* (Ven. 1581); *Dialoghi e Discorsi* (Ven. 1586-87); *Lettere Familiari* (Bergamo, 1588); *Rime* (Brescia, 1592-93); and *Gerusalemme Conquistata* (Rome, 1593). The most complete edition of his works appeared at Pisa (1821-32), in 33 vols. See Hasell's T. (1882).

TASTE, ORGAN AND SENSE OF. The principal seat of the sense of taste is the mucous membrane of the tongue, in which dissection reveals a *cutis* or *chorion*, a *papillary structure*, and an *epithelium*. Of the *cutis*, it is sufficient to remark that it is tough, but thinner and less dense than in most parts of the cutaneous surface, and that it receives the insertions of the intrinsic muscles of the tongue, which will be described when we treat of that organ generally. The *papillary structure* differs from that of the skin in not being concealed under the epithelium, but in projecting from the surface like the villi of the digestive canal, and it thus gives to the tongue its well-known roughness. The *epithelium* (q. v.) is of the scaly variety, as on the skin, but is much thinner on the tongue than on the skin. It is most dense about the middle of the upper surface of the tongue, and it is here that, in disordered digestion, there is the chief accumulation of *fur*, which in reality is simply a depraved and over-abundant formation of epithelium. The *papillæ* on the surface of the tongue are either *simple* or *compound*. The former, which closely resemble those of the skin, are scattered over the whole surface of the tongue in parts where the others do not exist, and they likewise participate in the formation of the compound papillæ, which, from their forms, are respectively termed (1) the *circumvallate* or *calyciform*, (2) the *fungiform*, and (3) the *conical* or *filiform*.

The *circumvallate* papillæ are not more than eight or ten in number, and are situated in the form of a V at the base of the tongue. Their function seems to be to secrete mucus, as well as to take part in the act of tasting. They consist of "a central flattened projection of the mucous membrane of a circular figure, and from $\frac{3}{10}$ to $\frac{1}{12}$ of an inch wide, surrounded by a tumid ring of about the same elevation."—Todd and Bowman, *Physiological Anatomy and Physiology of Man*, 2d ed. vol. i. p. 437. The *fungiform* papillæ are scattered over the surface in front of the circumvallate papillæ, and about the sides and apex. They are usually narrower at the base than at the apex, where they are about $\frac{1}{30}$ of an inch in diameter. They are covered with simple or secondary papillæ, and their investing epithelium is so thin that the blood circulating in them gives them a red color, which is not seen in the conical papillæ, among which they are distributed. They contain nerves terminating in loops. The shape of the *conical* or *filiform* papillæ is indicated by their names; and even if they take little part in the sense of taste directly, it is convenient to describe them here. Their average length is about $\frac{1}{10}$ of an inch. The papillæ terminate in long pointed processes, which are bathed by the mucus of the mouth, and are capable of moving in any direction, although they are generally inclined backward. Some of the stiffer of these epithelial processes inclose minute hairs. Messrs. Todd and Bowman surmise, on structural grounds, that the filiform papillæ "can scarcely share in the reception of impressions which depend on the contact of the sapid material with the papillary tissue. The comparative thickness of their protective covering, the stiffness and brush-like arrangement of their filamentary productions, their greater development in that portion of the dorsum of the tongue which is chiefly employed in the movements of mastication, all evince the subservience of these papillæ to the latter function rather than to that of taste; and it is evident that their isolation and partial mobility on one another must render the delicate touch with which they are endowed more available in directing the muscular actions of the organs. The almost manual dexterity of the tongue in dealing with minute particles of food is probably provided for, as far as sensibility conduces to it, in the structure and arrangement of these papillæ."—*Phys. Anat. and Phys. of Man*, vol. i. p. 441. Notwithstanding the difference in their outward form and mode of arrangement, the simple papillæ, which have been detected by Todd and Bowman as scattered over the whole dorsum of the tongue (although concealed under the common sheet of epithelium), and those clothing the circumvallate and fungiform papillæ, do not seem to present any structural difference; and their epithelium, which is very thin, readily permits the transudation of sapid substances dissolved in the mucus of the mouth. With regard to the use of the singular configuration of the circumvallate and fungiform papillæ, "it may be conjectured that the fissures and recesses about their bases are designed to arrest on their passage small portions of the fluids in which the sapid materials are dissolved, and thus to detain them in contact with the most sensitive parts of the gustatory membrane."—*Op. cit.* p. 441.

There has been much discussion regarding the precise seat of the sense of taste and the true nerves of taste. Although the surface of the tongue is the special seat of gustative sensibility in man, the sense of taste is by no means restricted to that organ, being diffused, in a less degree, over the soft palate, the arches of the palate, and the fauces. Moreover, the gustative sensibility varies on different parts of the surface of the tongue. It is generally allowed that acute taste "resides at the base of the tongue, over a region of which the circumvallate papillæ may be taken as the center, and also on the sides near the base. These parts are supplied solely by the glossal twigs of the glosso-pharyngeal nerves. Some writers, among whom are Valentine and Wagner, believe the mid-

dle and anterior parts of the dorsum of the tongue to be usually incapable of appreciating flavor; while numerous others hold the contrary opinion, with which our own careful and repeated experiments, on other persons as well as ourselves, quite accord. Sour, sweet, and bitter substances applied to the sides, and especially to the tip of the protruded tongue, we find to be at once distinguished; though, when placed on the middle of the dorsal region, they make little or no impression till pressed against the roof of the mouth. This region of the tongue is supplied almost solely by the lingual branch of the fifth nerve. We conclude generally, with regard to the tongue, that the whole dorsal surface possesses taste, but especially the circumferential parts, viz., the base, sides, and apex."—*Op. cit.*, pp. 442, 443. The investigations of Messrs. Todd and Bowman further show that the soft palate and its arches are endowed with taste in some persons, but not universally, while they got no evidence in any case of gustative sensibility on the pharynx, gums, or elsewhere. The soft palate and its arches are supplied by palatine branches from Meckel's ganglion, and sparingly by the glosso-pharyngeal nerves. From (1) the evidence afforded by the anatomical distribution of the nerves to parts enjoying the sense of taste, (2) the evidence of experiments, in which the various nerves of the tongue were divided, and (3) the evidence afforded by disease, it may be safely inferred that the glosso-pharyngeal and the lingual branches of the fifth pair of nerves respectively participate in the sense of taste; and there is also reason to attribute a share to the palatine branches of the fifth.

Impressions of taste may be produced by a mechanical or chemical excitement of the gustatory nerves. A quick light tap of the finger on the tip of the tongue causes a taste, sometimes acid, sometimes saline, which lasts for several seconds; and galvanism acts similarly. If the surface of the tongue, near the root, be touched with a clean dry glass rod, or a drop of distilled water be placed upon it, a slightly bitterish sensation is produced; and if the pressure be continued, a feeling of nausea ensues. If a small current of cold air be directed against the tongue, it excites a cool saline taste like that of saltpeter. From the experiments of E. H. Weber, it appears that one of the conditions requisite for the due exercise of the sense of taste is a temperature not departing far on either side from the natural standard. Thus, if the tongue be immersed for a minute in water at a temperature of 125°, or in iced water, the taste of sugar, etc., is no longer perceived. In order that sapid bodies should cause taste, it is necessary that they should be dissolved, and made to permeate the tissue of the papillæ, so as to come in contact with their nerves. This is proved by the two following facts: 1, that every substance, whether solid, fluid, or gaseous, which possesses a distinct taste, is more or less soluble in the fluids of the mouth, while substances which are perfectly insoluble are only recognized by the sense of touch; and 2, that if the most sapid substance be applied in a dry state to a dried part of the surface of the tongue, no sensation of taste is excited. Bitters and acids appear to be the most sapid bodies, since they may be diluted to a greater extent than any other known substances without ceasing to excite sensations of taste. Thus, according to Valentin, 1 part of extract of aloes, or of sulphuric acid, in 900,000 of water, and even 1 part of sulphate of quinia in 1,000,000 parts of water, may, with ease, be distinguished from perfectly pure water. "The contact of a sapid substance," says Dr. Carpenter, "much more readily excites a gustative sensation when it is made to press upon the papillæ, or is moved over them. Thus there are some substances whose taste is not perceived when they are simply applied to the central part of the dorsum of the tongue, but of whose presence we are at once cognizant by pressing the tongue against the roof of the mouth. The full flavor of a sapid substance, again, is more readily perceived when it is rubbed on any part of the tongue, than when it is simply brought in contact with it, or pressed against it. Even when liquids are received into the mouth, their taste is most completely discriminated by causing them to move over the gustative surface: thus, the "wine-taster" takes a small quantity of the liquor in his mouth, carries it rapidly over every part of its lining membrane, and then ejects it."—*Principles of Human Physiology*, 6th ed. p. 621. Most sapid substances affect the nerves of smell to a greater or less degree, as they pass down the throat; and it is this compound of taste and smell that constitutes *flavor*. It is a common habit to hold a child's nose when he is taking a nauseous draught, with the view, as is supposed, of deadening the taste. The efficacy of the process depends upon the exclusion of smell, and the reduction of the flavor of the medicine to its mere taste. The agreeable sensation produced by sipping good wine is due to what is termed its *bouquet*, or in other words, to its flavor, or combined taste and smell. Some substances leave a taste in the mouth very different from that which they first produced. This *after-taste* is usually bitter; but in the case of one of the most bitter substances known, namely, tannin, it is sweet. This connection seems, in a degree, to correspond to the complementary colors in vision.

There can be no doubt that the sense of taste has for its primary object to direct us in the choice of food, to make the act of eating agreeable, and to excite the flow of mucus and saliva which aid the digestive process; and among the lower animals, the instinctive perceptions connected with this taste are much more remarkable than in man. As a general rule, it is found that those substances whose taste is agreeable are useful articles of food, and *vice versâ*; although there are some well-known exceptional cases.

Sir Henry Holland, in his *Medical Notes and Reflections*, observes that in the majority of instances of actual illness, the desires of the patient as to food and drink may be safely complied with, even when some seeming extravagance of diet is suggested; and that in the early stage of recovery from gastric fevers he has seen many curious instances of such contrariety to all rule acquiesced in with manifest good to the patient. "Dietetics," he adds, "must become a much more exact branch of knowledge, before we can be justified in opposing its maxims to the natural and repeated suggestions of the stomach, in the state either of health or disease."

TATE, a co. in n.w. Mississippi; watered by Coldwater river, traversed by the Illinois Central railroad; about 390 sq. m.; pop. '90, 19,253, includ. colored. The surface is mostly level. The soil is fertile. The principal productions are corn, wheat, cotton, and potatoes. Co. seat, Senatobia.

TATE, NAHUM, a poet and dramatist, son of the Rev. Dr. Faithful Tate, was b. in Dublin in 1652, and educated at Trinity college, Dublin. In 1692, he succeeded Shadwell as poet-laureate, and held that dignity till his death in 1715. His habits were somewhat improvident, and in the latter part of his life resided within the precincts of the mint at Southwark, then a privileged sanctuary for debtors—hence perhaps that "downcast look" and inability to "say much for himself," for which, it is said, he was remarkable. His writings include nine or ten dramatic pieces, *Panacea*, or *a Poem on Tea*, various birthday odes, and an elegy on the death of Queen Mary. He lived to write the first birthday ode for George I. But Tate is best known by the metrical version of the Psalms, which he executed in conjunction with Dr. Nicholas Brady, chaplain to king William and queen Mary, which was attached to the prayer-book, and came into general use in the church of England, supplanting the older version made in the reign of Edward VI. by Sternhold and Hopkins.

TATHAM, WILLIAM, 1752-1819; b. England; emigrated to America in 1769 and engaged in business in Virginia. He served in the revolutionary war, was admitted to the bar in 1784, and two years later settled in Lumbarton, N. C., which he represented in the legislature in 1787. He was superintendent of the London docks, 1801-5, after which time he returned to this country. In 1817 he became a United States military storekeeper. Having lost his property he committed suicide on Washington's birthday by throwing himself before a cannon.

TATIAN, one of the early apologists of Christianity against the pagan philosophers, and the founder of a sect which, whether under his own name, or under various other appellations derived from its peculiar tenets or practices, attracted considerable notice in the primitive ages. Tatian was b. in Syria or Assyria about the year 110. Having cultivated rhetoric and philosophy in various places, he came to Rome about 162, where he became the disciple and friend of Justin the martyr, and was by him converted to Christianity. He is known to have written many works—*infinita volumina*, says Jerome—of which, however, only one is preserved, the Apology already referred to. The date of its composition is uncertain, but it seems probable that it was written before the death of Justin (166 A.D.). No trace appears in the Apology of the heterodox opinions of Tatian, and it is alleged by Tertullian (*Adv. Hær.* i. 28, 1) that it was not till after the death of Justin that he fell into the errors to which he has given a name. He then removed to the East, and is said to have established himself in Mesopotamia. Without entering into the details of Tatian's peculiar opinions, it will be enough to say that, especially in their moral aspect, they formed the foundation of one of the great divisions of Gnosticism. Starting from the common principle of dualism, and of the origin of matter from the evil principle, and its consequent evil nature, Tatian, unlike the Egyptian Gnostics, held the necessity of overcoming the corrupt nature of man, and purifying it by abstinence and ascetic rigor. Accordingly, he reprobated marriage, and condemned all sensual indulgence. One of his "opinions," affirming the damnation of Adam, was peculiarly odious to the orthodox party. He condemned the use of wine so strongly as to forbid it even in the celebration of the Eucharist, in which his followers permitted only water to be used, whence they received the name of *Hydroparastatai* (from *hydor*, water, and *paristemi*, I present), and in Latin *Aquarii*. From their generally rigorous asceticism, they were called *Encratites* (from *engkratein*, to keep continent). In their dogmatic views as to Docetism, the Demiurge, and Emanations, they differed little from other Gnostics of the Syrian school. See GNOSTICS, MANICHÆANS, MYSTICISM.

TATIUS, ACHILLES. See ACHILLES TATIUS.

TATTNALL, JOSIAH, 1762-1803; b. Georgia; joined the army of Gen. Wayne, 1780; appointed col., 1793; brig.-gen., 1800; was prominent in military affairs; often a member of the legislature; U. S. senator, 1796-99; governor of the state, 1800-2.

TATTAM, HENRY, D.D., LL.D., 1788-1868; b. Ireland; educated at Trinity college, Dublin, and at Göttingen and Leyden; ordained in the church of England; rector of St. Cuthbert's, Bedford, 1818-45; archdeacon of Bedford, 1844; rector of Stamford Rivers, Essex, 1849. He traveled in the east, and became distinguished as an orientalist, in which department he published various works. Among the ancient Syriac MSS. which he found at a convent in Egypt were the *Ecclesiastical History* of John bishop of Ephesus, and *Epistles of Ignatius*.

TATTERSALL'S is a famous market for riding and carriage horses situated in Grosvenor place, London. It was established about 1780 by Richard Tattersall, a groom of the duke of Kingston. At the present time it consists of a large and handsome building in the centre of which is a large court under a glass roof. It also includes tiers of large, airy stables constructed after the most approved style, and sufficient to accommodate over three hundred horses. It is a prominent rendezvous for sportsmen during the races, and it is said that the betting here regulates the betting throughout the country.

TATTNALL, a co. in s.e. Georgia; drained by the Great Ochoopee, the Cannouchee, and the Altamaha rivers, the last two being its n.e. and s. limits; about 1123 sq. m.; pop. '90, 10,253, chiefly of American birth, includ. colored. The surface is level; the soil sandy and unproductive; cotton, corn, sweet potatoes, and rice are the staples. Co. seat, Reidsville.

TATTOOING, a custom extensively prevalent among savage nations, of marking the skin with figures of various kinds, by means of slight incisions or punctures and a coloring matter. The term is of Polynesian origin, and is said to be derived from a verb *ta*, which signifies to strike. Tattooing is almost universal in the South Sea islands, except where Christianity and civilization have put an end to it. New Zealanders' heads, exhibiting tattooing, are among the curiosities to be seen in museums; and at one time it was very common for the masters of vessels visiting New Zealand to purchase them and bring them home, although there is too much reason to believe that the price paid for them stimulated the feuds of the natives. The tattooing of the New Zealanders and other South Sea Islanders often covers the whole face, and sometimes also the chest, arms, and other parts of the body with elaborate patterns. It is performed in youth, and marks the transition from boyhood to manhood, like the assumption of the *toga virilis* among the ancient Romans. The operation is accompanied with superstitious ceremonies, and is attended with considerable pain, which, of course, is to be endured with manly indifference. An instrument of bone, toothed on the edge, is employed, which is applied to the skin, and struck with a piece of wood, having first been dipped in a thick mixture made by rubbing down charcoal with a little water. The marks which result are permanent, and appear black on a brown skin; although they are dark blue on the skin of a European. Tattooing is, or has been, practiced in almost all parts of the world. It seems to be one of the practices prohibited to the Jews, in Lev. xix. 28, "Ye shall not make any cuttings in your flesh for the dead, *nor print any marks upon you*," from which may be inferred its prevalence among the surrounding tribes in the days of Moses, and its connection with their superstitions. The Bedouin Arabs, the Tunguses, and other eastern tribes, and many tribes of American Indians, practice it at the present day. Among the Bedouins, it is a favorite mode of female adornment. It prevailed among the ancient Thracians, and was distinctive of high rank. The ancient Britons also practiced it, and traces of it appear to have lingered in England till after the Norman conquest. Perhaps the practice of sailors to print anchors and other marks on their arms, may be regarded as a relic of it still subsisting.

TAU, Cross, in heraldry, a cross of a form somewhat resembling the Greek letter *Tau*. St. Anthony is generally represented with a cross of this description, embroidered on the left side of his garment.

TAUBERT, KARL GOTTFRIED WILHELM, a German pianist and composer, born in Berlin in 1811, studied philosophy at the university there, while studying composition under Berger and Klein. He taught music until 1831, when he was given the leadership of the court concerts. In 1841 he was made conductor of the royal opera. He was member of the Academy of Arts from 1839 and president of the musical section of the same from 1882. His works include the operas *The Kirmess* (1832), *Macbeth* (1857), *Cesario* (1874), music for the *Medea* of Euripides, and Shakespeare's *Tempest*. His songs were popularized by Jenny Lind and other noted singers. He died in 1891.

TAUCHNITZ, CHRISTIAN BERNHARD, Baron von, German publisher, nephew of K. C. T. Tauchnitz, born at Schleinitz, near Naumburg, in Prussian Saxony, Aug. 25, 1816. In 1837 he founded a publishing house at Leipsic, under the firm name "Bernhard Tauchnitz," which became celebrated for its critical editions of the Bible and of Greek and Roman classics, its dictionaries, juridical works, tables of logarithms, etc. He is best known to continental travelers for his convenient economic and well-printed *Collection of British Authors*, begun in 1841, and which in 1897 numbered over 3,200 volumes. In the publication of this series he adopted the principle of paying the authors for republishing their works, although at the time no international copyright laws existed. In 1866 he began a similar *Collection of German Authors*, and in 1886 the *Students' Tauchnitz Editions*, English and American works, with German introduction and notes. In 1860 he was created Baron, became British consul-general to Saxony in 1872, and was called to the house of peers in Saxony, 1877. He died at Trattlau, Saxony, Aug. 13, 1895.

TAUCHNITZ, KARL CHRISTOPH TRAUGOTT, a famous German printer and bookseller, was b. at Grosspardo, near Leipsic, in 1761. Bred a printer, he began, in 1796, a small printing business of his own in Leipsic, with which he shortly after conjoined publishing and type founding, and which, in process of time, became one of the greatest establishments of the kind in Germany. In 1809 he began the issue of a series of editions of the classic authors, the elegance and cheapness of which gave them a European circulation. By offering a prize of a ducat for every error pointed out, he was able to bring out, in 1828, an edition of Homer of extraordinary correctness. He was the first to introduce (1816) stereotyping into Germany; and he also applied it to music, which had not been attempted before. In the latter years of his busy life, he stereotyped the Hebrew Bible, and the Koran in the original Arabic. He died 1836.

TAULER, JOHN, a remarkable mystic and preacher, was b. at Strasburg about 1300, and died there June 16, 1361. About the year 1308, renouncing a considerable fortune, he entered into the mendicant order of Dominicans, and afterward studied theology in Paris, showing at that early period a predilection for speculative and mystic writings, as the scholastic philosophy and the prevailing theology of the schools did not satisfy him. Notwithstanding this tendency, his predominating practical turn of mind led him, on his return to Strasburg, to preaching and pastoral duty; and this he continued to practice with zeal and undaunted courage, even when, in consequence of the excommunication which the pope had hurled against the emperor Ludwig, the country had fallen into a state of dreadful distraction, and almost all the clergy, in obedience to the interdict issued by the bishop of Strasburg, had suspended worship. Although Tauler was now 50 years old, and had enjoyed celebrity for several years as a preacher, so powerfully was he influenced by a Waldensian of the name of Nicholas von Basel, who paid him a visit in 1340, that he gave himself up for two years to ascetic exercises and devout contemplation. Afterward, however, he betook himself more decidedly to vigorous exertions on behalf of the despised and oppressed people, and preached with wonderful power, inveighing against the avarice, ostentation, and hard-heartedness of the laity as well as of the clergy; and, although not departing from the doctrines of the church, yet fearlessly exposing its abuses, and even not sparing the pope. Thus it happened, that although he had indefatigably administered the consolations of religion in the midst of the horrors and desolation of the black death (q.v.), the bishop interdicted him from preaching, and he was obliged to quit his native town. He repaired to Cologne; but nothing further is known, either of his residence there or of his return to Strasburg, where, after a life full of toil, denial of self, and beneficence to others, he died, an old man of 60 years, and was buried in his cloister. If not the greatest German preacher of the middle ages as a whole, Tauler certainly was the greatest of his times. As his mysticism was in no way passive, but aimed at rising above the sad condition of his times and the failings of the church by inward piety and a love self-denying but at the same time active; so his style, both in his preaching and in his devotional work, was lively, impressive, picturesque, and had altogether a practical direction. Among his devotional works, the *Nachfolge des armen Lebens Christi* holds the first place. Whether the sacred hymns which bear his name really belong to him, is doubtful. Of his writings and sermons, in which he always used the German language, many have been preserved in MS.; and since 1498, numerous editions have been published, but untrustworthy, and often translated into the dialect of the place where they happened to be printed. A careful translation into new High-German has been published by Schlosser (*Predigten*, 3 vols. Frank. 1826; *Nachfolgung des armen Lebens Christi* (Frank. 1833); Schmidt, *Johannes Tauler von Strasburg* (Hamb. 1841); and Susannah Winkworth, *Life and Times of Tauler*, with 25 of his sermons translated from the German (Lond. and New York, 1857).

TAUNTON, city and co. seat of Bristol co., Mass.; on the Taunton river, and the New York, New Haven, and Hartford railroad; 36 miles s. of Boston. It was incorporated as a town in 1639, and as a city in 1864, and contains about a dozen villages. The notable buildings include the U. S. government building, Bristol co. court house, state hospital for the insane, and the public library. The city is lighted by gas, electricity, and naphtha, and has waterworks supplied from Lakeville ponds, electric street railroads connecting with Dighton, Somerset, Swansea, and Fall River, several national and savings banks, and about 20 churches. The U. S. census of 1890 reported for Taunton, 316 manufacturing establishments, employing \$7,891,382 capital, and 6,466 persons, paying \$3,141,273 for wages and \$4,799,287 for materials, and having a combined output valued at \$9,936,829. The principal manufactories are 9 large cotton mills, 10 foundries, brick and tile works, machine and printing press works, nail and tack mills, shoe button factories, copper works, a large britannia ware plant, silver-plating works, locomotive works, jewelry factory, and stove and furnace works. There are several daily, weekly, and monthly periodicals. Pop. '90, 25,448.

TAUNTON, parliamentary and municipal borough of England, capital of Somerset, is situated in the extensive and beautiful valley of Taunton Dean, or vale of Taunton, in the county of Somerset, 38 m. s.w. of Bristol in England. It communicates by railway with the Bristol and English channels. The streets are wide, well-paved, and lighted; the shops are modern and capacious, there are manufactures of silk and hosiery, and a trade in agricultural and dairy produce. Taunton is the headquarters of the Somerset archaeological and natural history society, in connection with which there is an extensive museum, placed in the ruins of the Norman castle—rich especially in fossils from the Devonian strata, and the bones of mammalia of the cave period from Mendip and

the Somersetshire gravels—and a well-conducted reading-room. There is a collegiate school founded by Bishop Fox, 1522, two dissenting colleges, several other good schools, and many charitable and other institutions. One member is returned to parliament. Pop. '91, 18,026. Ina, king of the West-Saxons, built a castle in Taunton about 700 A.D. This was soon after destroyed, but another fortress was built on the site soon after the conquest, at which period the town had a mint. In 1127, Giffard, bishop of Winchester, built and endowed a priory for the canons of St. Augustine; and in 1322 we find a house of Carmelite friars. The church of St. Mary is a magnificent specimen of perpendicular architecture, and is famous for its graceful and delicately ornamented tower. That of St. James was the conventual church of Taunton priory. The shire hall and the literary institution are handsome modern buildings. To Taunton castle Perkin Warbeck fled when he failed in storming Exeter. During the civil wars between Charles and the parliament, the town was twice besieged by Goring and twice successfully defended by Col. Blake. In Taunton, Monmouth received the heartiest welcome, and Judge Jeffreys exercised his unbounded cruelty.

TAUNUS MOUNTAINS. See NASSAU.

TAURIDA, a government of South Russia, bounded on the e., s., and s.w. by the sea of Azov and the Black sea. Area, 24,539 sq. m.; pop. '94, 1,247,159. The peninsula of the Crimea (q.v.) forms the southern portion of the government, and is connected with the northern portion by the isthmus of Perekop (q.v.) The region n. of the isthmus is flat; the Crimea contains mountain-ranges which rise upward of 5,000 feet. The only great river is the Dnieper, which forms the n.w. boundary; and the other principal streams are the Salgir and Alma in the Crimea. Among the salt lakes of the Crimea, which are very productive in salt, the lake of Sakky is celebrated for the efficacy of its waters in certain cases of disease. The climate is temperate and warm on the southern shores of the Crimea. The soil is fertile, but cultivation is carried on on a very limited scale. In the north the pasture is very rich, and cattle-breeding is the main employment of the inhabitants. In the south the mountains are clad with forests, the tobacco-plant is successfully cultivated, and fruit-growing and wine-culture are the principal occupations. The Crimean wines, the *bouquet* of which resembles that of Burgundy and the Rhenish wines, are of a very good quality. The native riches of the government, its excellent ports and harbors, promise great commercial progress. Simferopol (q.v.), in the Crimea, is the capital of the government, and Sevastopol (q.v.) and Theodosia are ports of rapidly increasing importance.

TAURINE, *Amido isathionic acid*, $C_2H_4(NH_2)SO_3H$, is a very remarkable substance occurring in the bile and in other animal products and tissues. In a state of purity it forms six-sided glistening prisms, which are perfectly transparent, neutral, devoid of odor, readily soluble in hot water, but difficult of solution in cold water, and insoluble in alcohol and ether. It does not enter into combination either with acids or bases. When heated, it undergoes decomposition, and evolves sulphurous acid, in consequence of the sulphur (upward of 25 per cent) which it contains. Taurine occurs naturally in the bile of many animals, including man. As a product of the decomposition of the bile, it may be found in the contents of the intestine and in the excrements; and in cases of jaundice it has been found in the blood, transudations, and urine. Its artificial formation has been noticed in the article **SYNTHESIS**. Its name is derived from the latin *taurus*, a bull, because taurine was first discovered in the bile of the ox.

TAUROME'NIUM. See TAORMINA.

TAURUS, MOUNT. See ANATOLIA.

TAUSIG, KARL, 1841–71; b. Warsaw; studied music under Liszt, and made a great reputation as a pianist and orchestral director. He was made court pianist at Berlin in 1865. He had an unusual musical memory, and played nearly all the chief compositions of the great masters without notes.

TAUSSIG, FRANK WILLIAM, political economist, born at St. Louis, Mo., Dec. 28, 1859. He was educated at Harvard university, from which he received the degrees of A.B., 1879; Ph.D. 1883; LL.B., 1886. He spent one year of study in Europe, and on his return was appointed professor of political economy in Harvard university. His writings include *Tariff History of the United States* (1888); *The Silver Situation in the United States* (1892); *Wages and Capital* (1896); and numerous contributions to scientific periodicals, chiefly to the *Quarterly Journal of Economics*.

TAUTOG' or BLACKFISH, *Tautoga nigra* or *Americana*, a fish of the family *labridæ* (q.v.), of the section forming the family *cyclo-labridæ* of Müller. It is found in the North American seas, and is in great request for the table. It brings a very high price in the New York market. It attains a size of 12 or 14 lbs. Its color is black on the back and sides; the belly is whitish; both jaws have a double row of strong conical teeth; the face is covered with a scaleless integument. The tautog is caught by hook and line on rocky bottoms. It is sometimes kept in ponds to fatten.

TAUTOLOGY (Gr. *tauto*, the same, and *logia*, speech) is a term used to denote the useless repetition of the same ideas in different words. It is considered one of the worst vices, whether of oral or written style, and certainly none more effectually robs language of its force and impressiveness.

TAVERNIER, JEAN BAPTISTE, BARON D'AUBONNE, a celebrated French traveler, was the son of a Flemish engraver who had settled in Paris, and was born there in 1605. The conversation of the savants who frequented his father's shop inspired him with an ardent curiosity to visit other countries, and prompted him to leave the parental roof before his 15th year. After visiting England, the Low Countries, Germany, Hungary, and Italy, he eagerly caught at the offer made to him by father Joseph (the confidant of Richelieu), to accompany two French noblemen to the east. This journey lasted from Dec., 1630, to the summer of 1633, the line of route passing through Regensburg, Dresden, Vienna, Constantinople (where he left his masters), Erzeroum, Tabriz, Ispahan, Bagdad, Aleppo, and Scanderoon, and thence by sea to Rome. Tavernier then obtained an important post in the household of the duke of Orleans, but received occasional leave of absence to prosecute his journeys in the east. Tavernier invariably traveled as a dealer in precious stones and other valuable articles of small bulk, and the great profits he realized strongly impressed upon him the advantages of regular commerce between Europe and the east. On his return to France in 1669 he was graciously received at court by Louis XIV., who presented him with "letters of nobility" in reward for his services to French commerce in India. But his prodigal expenditure and careless generosity speedily reduced his fortune, and the revocation of the edict of Nantes compelled him to take refuge in Switzerland, whence he removed to Berlin, and became director of an East India company which was projected by the elector of Brandenburg. With the view of discovering a road to the Indies through Russia, he set out from Berlin in 1688, but died at Moscow in July, 1689. An account of his travels was written for him by various parties (for Tavernier had no literary qualifications), and though full of matter valuable to the historian and geographer, it is so ill-arranged as to be in many cases almost unavailable. Tavernier was one of the most remarkable of travelers; wholly devoid of classic sentiment, he traversed the plains of Troy, and passed the ruins of Persepolis without even a flutter of interest, and partly owing to this remarkable condition of mind, his statements are distinguished by an accurate truthfulness little common among travelers. But the chief value of his book lies in the fullness and accuracy with which the nature and state of oriental commerce, the chief markets and commercial routes, and the various systems of coinage and the relations are detailed. Some of his statements concerning the conduct of the Dutch in the East Indies called forth a most virulent and abusive reply from Jurieu, the Protestant theologian, in his *L'Esprit de M. Arnauld* (1684), and a more moderate one from Van Quellenburgh; but all Tavernier's assertions which were of any moment were found to be perfectly correct. His travels were originally published in 3 vols. (two in 1676-77, and the third in 1679); they have since been several times republished, last in 1810, in 7 vols.; and have been translated into English (1678, 1684, 2 vols. 1890), Dutch (1682), and German (1684).

TAVIRA, a sea-port t. of Portugal, province of Algarve, 20 m. n.e. of Faros, pleasantly situated at the mouth of the Sequa. Tavira has decayed considerably since 1654, when, it is said, 40,000 people in the town and environs fell victims to the plague. Pop. 1890, 11,558.

TAVISTOCK, a market-town of Devonshire, picturesquely situated on the western border of Dartmoor, about 35 m. s.w. of Exeter, and 12 m. n. of Plymouth, in the fertile valley, and on the right bank, of the Tavy (whence its name), which is here crossed by two bridges within the town. Tavistock is a thriving town, with some small manufactures of serges and woolen cloths, iron-foundries and mining-works, copper, lead, tin and iron being found in considerable quantity in the neighborhood; but the population is chiefly agricultural. It is a place of considerable antiquity, and was formerly of great importance, owing mainly to its abbey, the largest and most magnificent in Devonshire, which was founded in the year 961 for the Benedictine order, by Ordgar, earl of Devonshire, father of the infamous Elfrida, and endowed with many privileges, the abbot being a peer of parliament. At the dissolution, when the revenue amounted to upward of £900, it was bestowed upon John, lord Russell, in possession of whose descendant, the duke of Bedford, the property still remains. A printing-press, the second set up in England, was established in the abbey at a very early period. The refectory and abbey gateway still exist in good preservation. The parish church is a handsome edifice, with a tower at the w. end, resting on arches, under which there is a thoroughfare. At the breaking out of the civil war Pym was member for Tavistock. Tavistock is one of the four stannary towns of the co., and is governed by a port-reeve, elected annually; a co. court is held in the town. It is connected with Barnstaple, Launceston, and Plymouth by railway, and with the river Tamar by a short canal. Sir Francis Drake was born in the immediate neighborhood in 1545, and the poet W. Browne in the town in 1590. Pop. '91, 6252.

TAVOLARA, an island in the Mediterranean Sea; off the n.e. coast of Sardinia, in lat. 40° 55' n.; called by the Romans *Bucina*. Near its eastern extremity is a lighthouse. It forms the southern coast of the Gulf of Terranova.

TAVOY, the capital of Tavoy, district in Tenasserim, British Burmah, is situated on the left bank of the Tavoy river, about 34 m. from its mouth, in lat. 14° 4' n., long. 98° 5' e. at the distance of about 162 m. w. of Bangkok. The site of Tavoy, which is low, is

inclosed on three sides by rice-fields, and on the fourth by the river. The houses are scarcely visible from the river—umbrageous trees, palms, plantains, jacks, cassias, and hundreds of flowering shrubs nearly concealing them from view. A wooden-covered pier, supported on piles, forms a convenient landing-place. There is a hospital, a large jail, and a roomy *zayat*, or caravansary. The houses, according to the universal practice of the country, are raised from the ground on piles, and are made of bamboo, fastened with rattan, and thatched with the leaf of the water-palm. Under many of the houses a loom may be observed, at which a female is generally busy at work. The shops are for the most part mere sheds or stalls, and the venders sit squatted on the raised floor in the midst of their wares. "In this little town," says a recent eye-witness, "Burman life and manners are seen in all their simplicity; and the observer cannot but be struck by the frugality, contentment, happiness, and enjoyment of life manifested by the people." The rice-fields around Tavoy are prolific sources of malaria. Intermitent fevers and dysentery are the most common diseases; but the climate is on the whole healthy, and is not considered inimical to the European constitution. According to the estimates of 1881, the population of Tavoy was 13,372. The bulk of these are true Burmans, the balance being made up with Shans and Thoughthoos, Karens, Chinese, Malays, and natives of India.

Vessels drawing not more than 12 ft. of water can reach the town of Tavoy by means of the Tavoy river. The anchorage for large ships is at Goodridge plains, about 30 m. below the town.

Tavoy used to be one of the stations in which British troops were settled, but these have been lately withdrawn. The district of which it is the capital has an area of 7200 sq. m.; and a pop. '81, of 84,988.

TAX SALES, a public sale of land, according to law, for non-payment of taxes assessed upon it. Some general principles may be stated, as running through the statutes of all or nearly all the states; but as the proceedings are regulated entirely by statute, the rights of the purchasers under, and of the original owners before such sales, the manner in which such sales are conducted, and the regulations in regard to laying taxes differ widely in different states. In the first place the assessed tax must be uncollected upon land unexempt. The land cannot be legally sold after payment or tender, either by the owner or any person whose interests would suffer by the sale. The statutory provisions before and during the sale must be exactly followed. The tax must have been properly assessed, the proper officer must have attempted to collect it, the sale must be public, duly advertised, take place at the advertised time and place, etc. The land is sold to the highest cash bidder, to whom a certificate is given, entitling him to a deed at the end of the statutory period, during which the owner may redeem, and after which a deed from the state is given to the purchaser. In a majority of the states at present this deed is *prima facie* evidence of the regularity of all the proceedings on the sale. At common law, and by the statutes of some states, it rests upon the purchaser to prove the regularity of such proceedings. In some states it must have been decided by the proper court that the taxes are unpaid, before a sale can take place.

TAX—TAXATION. This term, as expressing the exaction of money from the individual for the service of the state, is familiar to all mankind a step above barbarism; and yet few subjects are surrounded by a greater number of practical difficulties and theoretical niceties. These may be grouped under two sets of considerations—those which affect the justice of a tax, and those which affect its productiveness, and these two often tell on each other. Taxation, indeed, has so frequently been the means of perpetrating political injustice, that the term has fallen into bad popular repute. Whenever the produce of a tax is used otherwise than in the service of those who pay it, the tax is unjust. In its more oppressive form, it has been levied on conquered states, for the benefit of the conquerors, and in this shape it has sometimes been called tribute. The direction which all constitutional struggles to cleanse taxation from injustice have taken has been that of self-taxation, the community as a whole deciding on what it requires to take from the individual members for the public service. The accomplishment of this has been the chief object of all the struggles which have made a free constitution for the English races. There were old feudal dues which the monarchs had the power of exacting; but when these were insufficient for their ambitious projects, they had to ask parliament for a supply, and parliament generally took the opportunity of granting it to demand redress of grievances. It came thus to be a fundamental constitutional doctrine, that no tax can be levied save by the consent of the representatives of the people who have to pay it. The constitutional doctrine thus created by Britain was remembered by the American colonies when Mr. Grenville sought to raise there a stamp-duty and a customs-duty on tea, and the colonies revolted under the celebrated cry that "taxation without representation is tyranny!"

It was discovered, in the course of the long struggle of the house of commons to keep its hold on the purse, that the least afflictive of taxes may be the most dangerous. A fixed land-tax comes, for instance, to be no impost at all, in the afflictive sense of the term. If a thousand a year have been drawn off a certain acreage of land from time immemorial, the proprietors never possessed that part of the rents, and are no more

sufferers from not having them than from not possessing their neighbors' estates. A government with a large revenue of this kind, however, will certainly be inimical to freedom. The time when the liberties of England were in the greatest danger was the twelve years of Charles I.'s reign in which he was able to get on without going to parliament for money. The extravagance of sovereigns who wasted the domains of the crown has generally prevented them from having too formidable an influence by the possession of independent incomes. In Britain, this difficulty has been effectually guarded against, and any of the expenses of the crown which can now be paid without going annually to parliament for a vote of supply are of a very trifling character.

How to make taxation productive, is a vast and complicated practical science. Turgot, one of the wisest of financiers, called it the art of plucking the goose without making it cry. The most ingenious devices to this end, however, have often, in practice, met with counteracting difficulties. It was supposed that indirect taxation—that is, a duty levied on articles before they reach the consumer, must, in a civilized and orderly country, be almost inexhaustible. The merit of the system lay in the consideration, that the burden of the tax did not fall on the person who paid it. Income-tax, house-tax, dog-tax, and the like are levied directly on the person on whom the burden ultimately falls, and if he do not pay, the amount will be taken by force. Tea-duty, wine-duty, and the like, however, are not levied on the consumer, though he has to pay them; they are levied on the importer, who has no, or a very slight, interest against the tax, since he must charge it on the consumer. But this form of taxation is met by checks. If it is excessive, people will not buy the taxed article; and it has often been found that reducing the duty increases the revenue. An indirect tax on luxuries, and especially on those which may be used to vicious excess, has strong recommendations. In some cases, it is no great calamity should the tax throw the article nearly out of use. But then comes another check in the smuggler, whose profession may probably do more to corrupt and disorganize society than the free use of the article in which he deals. A tax on the necessities of life, on bread or salt, cannot be evaded, as in the case of luxuries, by the abandonment of use, and therefore it is very productive, but it is also very oppressive. The tax on salt in France was one of the chief causes of the French revolution. The happiest condition for the revenues of a country is when luxuries are so abundantly used by all classes that a small addition to their price is a slight burden, yet yields a large revenue. In Gt. Britain, the revenue thus derived from tea, tobacco, and stimulants may be set down in round numbers at 30 millions. The chief taxes which now form the revenue of Britain are—1. Those by old custom called “assessed,” and levied upon certain items in the possessions and enjoyments of the citizen, as his male-servants, dogs, carriages, and armorial bearings. 2. The property and income tax, which, after long disuse, was renewed in 1842, and is raised from time to time according to the exigencies of the government. 3. The customs. 4. The excise. 5. The stamps and post-office; and 6. The land-tax. See CUSTOMS-DUTIES, EXCISE, POST-OFFICE, STAMPS, LAND-TAX, FINANCE. The constitution of the United States formally vests in the general government the right of imposing taxes upon the people so far as duties on imports or exports are concerned; also requires that all bills for raising revenue shall originate in the house of representatives. No state is permitted to lay any impost or duty on imports or exports (except what may be necessary for executing its inspection laws) without consent of congress; and the net produce of all such duties and imposts is required to be for the use of the treasury of the United States. But no tax or duty can be laid by congress on articles exported from any state; nor can any capitation or other direct tax be laid, except in proportion to the authorized census or enumeration. The systems of taxation in the United States are therefore two in number: that of the national government; and that observed by the state governments, each in its sovereign capacity. Taxation by the national government is required to be uniform throughout the country; and direct taxation from this source must be apportioned to the states in accordance with their respective population. Until the war of the secession the national government relied wholly on duties on imports for funds to carry on the government; but from that time it has been found necessary to add to this source of income taxation on various domestic manufactures; and during the war an income tax was imposed. The required internal revenue taxes were placed upon the capital and circulation of banks; on beer, ale, wines, whisky, cigars, tobacco, patent medicines, cosmetics, etc.; on matches, wax-tapers, cigar-lights, etc. The table on the following page shows the receipts of the United States by taxation from March 4, 1789, to June 30, 1890:

State taxation is direct, and is either through poll-taxes upon individuals, or by assessment upon property. Not all the states levy poll-taxes, the plan being obnoxious to many. Taxation upon real estate is levied through assessment by duly appointed assessors, on proper estimates made by these officials. The custom is to assess real estate at from one-quarter to one-half its market value. Local taxes in counties, towns, cities, and school-districts are levied in accordance with general statutes or by special charter, and are apportioned in accordance with the state valuation, except as to improvements in cities, which are made chargeable on adjoining property. Taxation on personal property is levied on returns made by the persons or corporations in question. In the neces-

| YEARS. | Customs. | Internal Revenue. | Direct Tax. |
|---------|----------------|-------------------|--------------|
| 1789-91 | \$4,399,473 09 | | |
| 1792 | 3,443,070 85 | \$208,942 81 | |
| 1793 | 4,255,306 56 | 337,705 70 | |
| 1794 | 4,801,065 28 | 274,089 62 | |
| 1795 | 5,588,461 26 | 337,755 36 | |
| 1796 | 6,567,987 94 | 475,289 60 | |
| 1797 | 7,549,649 65 | 575,491 45 | |
| 1798 | 7,106,061 93 | 644,357 95 | |
| 1799 | 6,510,449 31 | 779,136 44 | |
| 1800 | 9,080,932 73 | 809,396 55 | \$734,223 97 |
| 1801 | 10,750,778 93 | 1,048,083 43 | 534,343 38 |
| 1802 | 12,438,235 74 | 621,898 89 | 206,565 44 |
| 1803 | 10,479,417 61 | 215,179 69 | 71,879 20 |
| 1804 | 11,038,565 33 | 50,941 29 | 50,198 44 |
| 1805 | 12,986,487 04 | 21,747 15 | 21,882 91 |
| 1806 | 14,667,698 17 | 20,101 45 | 55,763 86 |
| 1807 | 15,845,521 61 | 13,051 40 | 34,732 56 |
| 1808 | 16,363,550 58 | 8,190 23 | 19,159 21 |
| 1809 | 7,257,506 62 | 4,034 29 | 7,517 31 |
| 1810 | 8,583,309 31 | 7,430 63 | 12,448 68 |
| 1811 | 13,313,222 73 | 2,295 95 | 7,666 22 |
| 1812 | 8,958,777 53 | 4,903 06 | 859 22 |
| 1813 | 13,224,623 25 | 4,755 04 | 3,805 52 |
| 1814 | 5,998,772 08 | 1,662,984 82 | 2,219,497 36 |
| 1815 | 7,282,942 22 | 4,678,059 07 | 2,162,673 41 |
| 1816 | 36,306,874 88 | 5,124,708 31 | 4,253,635 09 |
| 1817 | 26,283,348 49 | 2,678,100 77 | 1,894,187 04 |
| 1818 | 17,176,385 00 | 955,270 20 | 264,333 36 |
| 1819 | 20,283,608 76 | 229,593 63 | 83,650 78 |
| 1820 | 15,005,612 15 | 106,260 53 | 31,586 82 |
| 1821 | 13,004,447 15 | 69,027 63 | 29,349 05 |
| 1822 | 17,589,761 94 | 67,665 71 | 20,961 56 |
| 1823 | 19,088,433 44 | 34,242 17 | 10,337 71 |
| 1824 | 17,878,325 71 | 34,663 37 | 6,201 96 |
| 1825 | 20,088,713 45 | 25,771 35 | 2,330 85 |
| 1826 | 23,341,331 77 | 21,589 93 | 6,638 76 |
| 1827 | 19,712,283 29 | 19,885 68 | 2,626 90 |
| 1828 | 23,205,523 64 | 17,451 54 | 2,218 81 |
| 1829 | 22,681,965 91 | 14,502 74 | 11,335 05 |
| 1830 | 21,922,391 39 | 12,160 62 | 16,980 59 |
| 1831 | 24,224,441 77 | 6,933 51 | 10,506 01 |
| 1832 | 28,465,237 24 | 11,630 65 | 6,791 13 |
| 1833 | 29,032,508 91 | 2,759 00 | 394 12 |
| 1834 | 16,214,957 15 | 4,196 09 | 19 80 |
| 1835 | 19,391,310 59 | 10,459 48 | 4,263 33 |
| 1836 | 23,409,940 53 | 370 00 | 728 79 |
| 1837 | 11,169,290 39 | 5,493 84 | 1,687 70 |
| 1838 | 16,158,800 36 | 2,467 27 | |
| 1839 | 23,137,924 81 | 2,553 32 | 755 25 |
| 1840 | 13,499,502 17 | 1,682 25 | |
| 1841 | 14,487,216 74 | 3,261 36 | |
| 1842 | 18,187,908 76 | 495 00 | |
| 1843 | 7,046,843 91 | 103 25 | |
| 1844 | 26,183,570 94 | 1,777 34 | |
| 1845 | 27,528,112 70 | 3,517 12 | |
| 1846 | 26,712,667 87 | 2,897 26 | |
| 1847 | 23,747,864 66 | 375 00 | |
| 1848 | 31,757,070 96 | 375 00 | |
| 1849 | 28,346,738 82 | | |
| 1850 | 39,668,686 42 | | |
| 1851 | 49,017,567 92 | | |
| 1852 | 47,339,326 62 | | |
| 1853 | 58,931,865 52 | | |
| 1854 | 64,224,190 27 | | |
| 1855 | 53,025,794 21 | | |
| 1856 | 64,022,863 50 | | |
| 1857 | 63,875,905 05 | | |
| 1858 | 41,789,620 96 | | |
| 1859 | 49,565,824 38 | | |
| 1860 | 53,187,511 87 | | |
| 1861 | 39,582,125 64 | | |
| 1862 | 49,056,397 62 | | 1,795,331 73 |
| 1863 | 69,059,642 40 | 87,640,787 95 | 1,485,103 61 |
| 1864 | 102,316,152 99 | 109,741,134 10 | 475,648 96 |
| 1865 | 84,928,260 60 | 209,464,215 25 | 1,200,573 03 |
| 1866 | 179,046,651 58 | 309,226,813 42 | 1,974,754 12 |
| 1867 | 176,417,810 88 | 266,027,537 43 | 4,200,233 70 |
| 1868 | 164,464,599 56 | 191,087,589 41 | 1,788,445 85 |
| 1869 | 180,048,426 63 | 158,356,460 86 | 765,685 61 |
| 1870 | 194,538,374 44 | 184,899,756 49 | 229,102 88 |
| 1871 | 206,270,408 05 | 143,098,153 63 | 580,355 37 |
| 1872 | 216,370,286 77 | 130,642,177 72 | |
| 1873 | 188,089,522 70 | 113,729,314 14 | 315,254 51 |
| 1874 | 163,103,833 69 | 102,409,784 90 | |
| 1875 | 157,167,722 35 | 110,007,493 58 | |
| 1876 | 148,071,984 61 | 116,700,732 03 | 93,798 80 |
| 1877 | 130,956,493 07 | 118,630,407 83 | |
| 1878 | 130,170,680 20 | 110,581,624 74 | |
| 1879 | 137,250,047 70 | 113,561,610 58 | |
| 1885 | 181,471,939 | 112,498,726 | |
| 1890 | 229,668,585 | 142,606,706 | |

sary legislation toward an equitable system of taxation, certain exemptions are made, including the following: property belonging to incorporated institutions of learning endowed by private individuals; houses of worship and certain other church property; public cemeteries; personal property sufficient to cover the necessities of life; and public property, both state and national; public lands, custom-houses, school-houses, court-houses, parks, etc. The propriety of extending freedom from taxation to institutions of learning and church property is often brought in question, and powerful arguments have been employed on both sides. Inasmuch as it is very largely considered from a sentimental point of view, it is improbable that any change will soon be made on this question.

SUMMARY OF INTERNAL REVENUE RECEIPTS FROM ALL SOURCES FOR TWENTY-ONE YEARS, 1863-84.

| YEARS. | Spirits. | Tobacco. | Ferment- ed Liquors. | Banks and Bankers. | Penalties, etc. | Adhesive Stamps. | Articles and occupations formerly taxed but now exempt. |
|------------------|---------------|---------------|-------------------------|-----------------------|--------------------|---------------------|---------------------------------------------------------------------|
| 1863..... | \$5,176,530 | \$3,097,620 | \$1,628,934 | ..... | \$27,170 | \$4,140,175 | \$26,932,763 |
| 1864..... | 30,329,150 | 8,592,099 | 2,290,009 | \$2,837,720 | 193,600 | 5,894,945 | 67,008,225 |
| 1865..... | 18,731,422 | 11,401,373 | 3,734,928 | 4,940,871 | 520,363 | 11,162,392 | 160,638,180 |
| 1866..... | 33,268,172 | 16,531,008 | 5,220,553 | 3,463,988 | 1,142,853 | 15,044,713 | 236,296,037 |
| 1867..... | 33,542,952 | 19,765,148 | 6,057,501 | 2,046,562 | 1,459,171 | 16,094,718 | 186,954,423 |
| 1868..... | 18,655,531 | 18,730,095 | 5,955,869 | 1,866,746 | 1,256,882 | 14,852,252 | 129,863,090 |
| 1869..... | 45,071,231 | 23,430,708 | 6,099,880 | 2,196,054 | 877,089 | 16,420,710 | 65,943,673 |
| 1870..... | 55,606,094 | 31,350,708 | 6,319,127 | 3,020,084 | 927,905 | 16,544,043 | 71,567,908 |
| 1871..... | 46,281,848 | 33,578,907 | 7,389,502 | 3,644,242 | 636,980 | 15,342,739 | 87,136,958 |
| 1872..... | 49,475,516 | 33,736,171 | 8,258,498 | 4,628,229 | 442,205 | 16,177,321 | 19,053,007 |
| 1873..... | 52,099,372 | 34,386,303 | 9,324,938 | 3,771,031 | 461,653 | 7,702,377 | 6,329,782 |
| 1874..... | 49,444,090 | 33,242,876 | 9,304,680 | 3,387,161 | 364,216 | 6,136,845 | 764,880 |
| 1875..... | 52,081,991 | 37,303,462 | 9,144,004 | 4,097,248 | 281,108 | 6,557,230 | 1,080,111 |
| 1876..... | 56,426,365 | 39,795,340 | 9,571,281 | 4,006,698 | 409,284 | 6,518,488 | 509,631 |
| 1877..... | 57,469,430 | 41,106,547 | 9,480,789 | 3,829,729 | 419,999 | 6,450,429 | 238,261 |
| 1878..... | 50,420,816 | 40,091,755 | 9,937,052 | 3,492,032 | 346,008 | 6,380,405 | 429,659 |
| 1879..... | 52,570,285 | 40,135,003 | 10,729,320 | 3,198,884 | 578,591 | 6,237,538 | ..... |
| Total in 17 yrs. | \$706,650,795 | \$466,275,123 | \$120,446,865 | \$54,427,279 | \$10,245,077 | \$177,650,960 | \$1,010,686,588 |

The total cost of collecting internal revenue in the United States for the fiscal year ended June 30, 1884, was as follows:

| | |
|------------------------------------------------------------------------------------------------------------|------------------|
| For salaries and expenses of collectors, including pay of deputy collectors, clerks, etc. | \$1,854,982 10 |
| For salaries and expenses of revenue agents, surveyors of distilleries, gaugers, and storekeepers..... | 2,438,000 00 |
| For dies, paper, and stamps..... | 454,311 69 |
| For salaries of clerks, officers, and employees in the office of the commissioner of internal revenue..... | 296,421 48 |
| For expenses of detecting and punishing violations of internal revenue law..... | 56,736 51 |
| Total cost..... | \$5,100,451 84 |
| Total collections (not including commissions on sale of stamps)..... | \$121,368,620 00 |

Experience has shown that taxes are least easily collected when reliance as to assessment has to be made on personal statements as to amount of taxable values; and when, as is the case in regard to distilled spirits, the temptation to illicit manufacture is great, or, as is the case in regard to cigars and other articles which admit of ready concealment, the element of smuggling enters into the question. Stamp duties are found to be the least onerous, the most easily collected, and to press the most equally in all directions, thus avoiding special occasion for irritation.

TAXATION OF COSTS is the checking or reviewing of the charges made by attorneys or solicitors for legal business; and there is an officer of the court provided for the purpose, called in England a master or a taxing-master, or a registrar, according to the nature of the court; in Scotland, he is called an auditor. Solicitors differ from all other professions in this, that they are treated as officers of the court, and they are not at liberty to charge what prices they please for the various services they perform. Hence, every step in a suit has a certain value put upon it by the court, and the business of the taxing-officers is to see that this standard is not transgressed.

While the term taxation of costs is retained in the legal vocabulary in the U. S., its meaning is essentially different from that which it has in England. In the U. S., after a verdict in a litigated case, the successful attorney serves upon his adversary a notice that at a certain time and place he will apply to the clerk of the court to tax the costs in the action in accordance with a statement which is given with the notice. The bill of costs includes, first, a certain sum allowed by statute to the successful party. The amounts differ in different states, but the general principle is the same. Then, the items of disbursements. If, e. g., a verdict was rendered in any N. Y. court of record for a sum of money amounting to more than \$50, the plaintiff's attorney could collect, in addition to the amount of the verdict, costs amounting to \$55, and as disbursements any sums paid in the action for witness' fees, clerk's fees, proper printing bills, sheriff's fees, etc. There are also costs on appeals, etc. The theory upon which these costs are allowed is that they are to reimburse the client for his expenses in the litigation; but as a matter of practice they are retained by the attorney. The statutory costs, however, are not given in place of compensation to the attorney, and do not affect the amount of his compensation.

TAXEL. See **BADGER**.

TAXICORNÉS, a family of coleopterous insects, of the section *heteromera*, having the body generally square; the thorax either concealing or receiving the head; the antennæ short; the legs adapted for running. Most of them are found in fungi and beneath the bark of trees. They are widely distributed over the world.

TAXIDERMY, the art of preparing the skins of animals for the purposes of the naturalist. The chief means employed in preparing the skin for stuffing in the case of small animals is to remove it carefully from the body, and, having cleaned away from it any adherent flesh, etc., to anoint it with arsenical soap; for the making of which there are several formulæ, the following being the most used: arsenic, 1 ounce; white soap, 1 ounce; carbonate of potash, 1 dram; distilled water, 6 drams; camphor, 2 drams. This keeps the skin supple, and prevents decay and the attacks of insects. The larger skins are generally prepared with a composition called preservation powder, which is made of the following ingredients: arsenic and burnt alum, each 1 lb.; powdered oak-bark, 2 lbs.; camphor $\frac{1}{2}$ lb. These substances are all reduced to a powder, mixed, and passed through a fine sieve. It requires to be carefully kept in well-stoppered bottles or jars, and when used, is thickly sprinkled over the flesh-side of the skin while still wet, and must be thoroughly rubbed in. Gloves should always be worn in this process to prevent danger from the poisonous compound. Some skins are prepared with alum only, and others with the oak-bark liquor of the tanner's pits. This, in the case of very large skins, answers very well.—Besides the mere preparation of the skin, the art of taxidermy is held to mean also the stuffing and mounting of them. This requires much personal experience, and almost every group of animals must be treated differently. See Davie, *Methods of Taxidermy* (1894).

TAY, the longest river in Scotland, draining nearly the whole of Perthshire (q. v.), and pouring into the German ocean a greater bulk of water than any other British river, has its source in the western part of the county of Perth. The Dochart, the principal feeder of loch Tay, rises in Ben Lui, on the borders of Argyleshire, and flowing in a n.e. direction, is joined by the Lochy, just before the united streams enter the lake. After leaving it, the Tay flows for some distance e.n.e., when turning southward, it passes, with a very winding course, Dunkeld (q. v.), and Perth (q. v.); about a mile below the latter place, it again changes its direction to e.n.e., widening at the mouth of the Earn (q. v.) into an estuary—the firth of Tay—which varies from three-fourths of a mile to three m. in breadth, and lies mostly between the counties of Fife and Forfar, joining the German ocean about 10 m. below Dundee (q. v.). It is navigable to Perth. Total length, 118 m.

TAYLER, JOHN JAMES, D.D., 1798–1869; b. England; graduated, university of Glasgow, 1818; minister of a Unitarian congregation at Manchester, 1820; professor of church history, subsequently of theology, in the dissenting college at Manchester; principal of the college after its removal to London, taking the name of Manchester new college; was co-pastor with Rev. James Martineau of the Unitarian congregation in Little Portland street. He published *Retrospect of the Religious Life of England*; *Christian Aspects of Faith and Duty*; *Attempt to Ascertain the Character of the Fourth Gospel*; *Catholic Christian Church the Want of Our Time*.

TAY, LOCH is a long and narrow lake in Scotland, situated in a basin scooped out of the bosom of the mountains, 355 ft. above the sea-level, in length about 15 m., and average breadth 1 m., varying from 100 to 600 ft. in depth. Ben Lawers lies on its w. side. The loch is at times subject to violent and unaccountable agitations.

TAYLOR, a co. in n. Florida; bounded on the s.w. by the Gulf of Mexico; drained by the Aucilla river; 1079 sq.m.; pop. '90, 2122. Co. seat, Perry.

TAYLOR, a co. in w. central Georgia; drained by the Flint River, which bounds it on the n.e., and by Whitewater creek; 356 sq.m.; pop. '90, 8666. Co. seat, Butler.

TAYLOR, a co. in s.w. Iowa; drained by Platte river, One Hundred and Two river, and Honey creek; 540 sq. m.; pop. '90, 16,384. Co. seat, Bedford.

TAYLOR, a co. in s. central Kentucky; watered by Robinson's creek and the Green river; 270 sq. m.; pop. '90, 9353. The surface is rolling. Co. seat, Campbellsville.

TAYLOR, a co. in n.w. central Texas; drained by a branch of the Brazos river, 900 sq. m.; pop. '90, 6756. Co. seat, Abilene.

TAYLOR, a co. in n. West Virginia; drained by Tygart's Valley river, traversed by the Baltimore and Ohio railroad; about 177 sq. m.; pop. '90, 12,147. Iron is found, and there are foundries and machine shops. Co. seat, Grafton.

TAYLOR, a co. in n. Wisconsin; formed 1875; 990 sq. m.; pop. '90, 6731. Co. seat, Medford.

TAYLOR, a magisterial dist., Orange co., Va. Pop. '90, 4787.

TAYLOR, BAYARD, American author and traveler, was the fourth child of Joseph and Rebecca (Way) Taylor, and was born at Kennett Square, Chester co., Pa., Jan. 11, 1825. His father was a descendant of an English immigrant of 1681, and his grandmothers on both sides were of German descent. His education was obtained in the

common schools and academies of the vicinity, and having no taste for farming, he was apprenticed in 1842 to the editor of the *West Chester Village Record*. He had already contributed to the *Saturday Evening Post* of Philadelphia, and secured the friendship of Rufus W. Griswold, and in 1844 he made another advance by publishing *Ximena and other Poems*. In 1844-45 he made a pedestrian tour through Europe, described in letters to the *New York Tribune*, and to Philadelphia papers, and in his *Views Afoot* (1840). He now dropped the surname "James," which a boyish fancy had led him to adopt, and on attaining his majority became joint editor, Dec., 1846, of the *Phoenixville Pioneer*, but in 1847 went to New York, where he became a writer on the *Literary World*, and subsequently one of the editorial staff of the *Tribune*, a connection retained as long as he lived. As its special correspondent he visited California and Mexico in 1849; Egypt, Syria, Asia Minor, and Europe in 1851, and in 1852 visited England and then crossed Asia to Calcutta. From there he passed to China to join the expedition of Commodore Perry to Japan. In 1857 he took as his second wife Marie Hansen of Gotha, and built a new home, "Cedarcroft." In 1862-63 he was United States secretary of legation, and later *chargé d'affaires* at St. Petersburg, and was influential in securing for the northern states the sympathy of Russia during the civil war. In 1869 he wrote an ode for the dedication of the national monument at Gettysburg. In 1874 he revisited Egypt, and in the same year attended the millennial celebration in Iceland, contributing a poem to the exercises. He wrote the ode for the opening of the Centennial Exhibition at Philadelphia, July 4, 1876, and recited it on that occasion. In Feb., 1878, he was appointed minister to Germany, where he had previously resided at intervals, and there, at Berlin, he died, Dec. 19, 1878. His body was removed to this country and buried at Kennett Square.

Taylor was a man of fine presence and attractive social qualities, and a popular lecturer, as well as author. His books of travel, besides *Views Afoot*, are, *El Dorado, or Adventures in the Path of Empire* (2 vols., 1850); *A Journey to Central Africa* (1854); *The Lands of the Saracen* (1854); *A Visit to India, China, and Japan* (1855); *Northern Travel* (N. Y., 1855); *Travels in Greece and Rome* (1859); *At Home and Abroad, a Sketch Book of Life, Scenery, and Men* (1859, 2d series, 1862); *Colorado, a Summer Trip* (1867); *By-ways of Europe* (1869); *Egypt and Iceland* (1874). His other prose works were the novels, *Hannah Thurston, a Story of American Life* (1865); *John Godfrey's Fortunes* (1864); *The Story of Kennett* (1866); and *Joseph and His Friend* (1870); *Boys of Other Countries*; *Stories for American Boys* (1876); and unfinished biographies of Goethe and Schiller. He also edited, with George Ripley, *A Handbook of Literature and the Fine Arts* (1852); a *Cyclopædia of Modern Travel* (Cincinnati, 1856), and an *Illustrated Library of Travel, Exploration, and Adventure* (vols. I.-IV. 1872-74); and translated Auerbach's *The Villa on the Rhine* (1869). His poetical works, besides *Ximena*, are, *Rhymes of Travel, Ballads, and Other Poems* (1840); *The American Legend*, a poem delivered before the Phi Beta Kappa society of Harvard University (1850); *Book of Romances Lyrics, and Songs* (1851); *Poems and Ballads* (1854); *Poems of the Orient* (1855); *Poems of Home and Travel*, selections from early lyrics (Boston, 1855); *The Poet's Journal* (1862); *The Picture of St. John* (1866); *The Ballad of Abraham Lincoln* (1869); *The Masque of the Gods* (1872); *Lars, a Pastoral of Norway* (1873); *The Prophet, a Tragedy* (1874); *Home Pastorals, Ballads, and Lyrics* (1875); *Centennial Ode* (1876); *Prince Deukalion*, a drama (1878). His translation into the original metres of both parts of Goethe's *Faust* (1870-71), is one of America's finest contributions to literature. His *The Echo Club and other Literary Diversions* (1876), contains parodies that rival the famous "Rejected Addresses" of James and Horace Smith. He also edited *Frithiof's Saga*, translated by Blackley from the Swedish of Tegnér (1867); furnished notes to the *Narrative of Perry's Expedition*, and an introduction to R. H. Stoddard's *Life of Alexander von Humboldt*. See Bayard Taylor, *His Life and Writings* (2 vols., 1884).

TAYLOR, BENJAMIN COOK, D.D., 1801-81; b. Philadelphia, graduated at Princeton college, 1819; began the study of theology with the Rev. Dr. John M. Mason, New York, and completed his course at the theological seminary of the Reformed church, New Brunswick, N. J.; pastor of the united churches of Greenbush and Blooming Grove, N. Y., 1822-25; accepted a call to Passaic, N. J.; became pastor of the Reformed church of Bergen, N. J., 1828; relieved from active duties, 1870, and made *pastor emeritus*. He published *Annals of the Classis and Township of Bergen*, and some sermons.

TAYLOR, BENJAMIN FRANKLIN, LL.D., author, was born in Lowville, N. Y., July 19, 1819. He graduated from Madison University in 1839, and became literary editor of the *Chicago Evening Journal*. During the civil war he was its war correspondent for the western armies, and his letters attracted much attention, many of them being translated and published in European papers. After the war he traveled in Mexico, and was a public lecturer for many years. He has published many books, among them *Attractions of Language* (1845); *January and June* (1853); *Pictures in Camp and Field* (1871); *Songs of Yesterday* (1877); *Between the Gates* (1881); *Dulce Domum* (1884); and *Thophilus Trent* (1887). He is best known by his poems, *The Isle of Long Ago*, *The Old Village Choir*, and *Rhymes of the River*. He died in 1887.

TAYLOR, BROOK, a celebrated English mathematician, was born at Edmonton, in Middlesex, Aug. 18, 1665, of a Puritan family of good position; entered St. John's college,

Cambridge, in 1701, at a time when mathematical science was the prominent pursuit among the learned; took his degree of LL.B. in 1709; became a fellow of the Royal society in 1712, and its secretary in 1714, in which latter year he also took the degree of LL.D. Though so young, he had become widely known in Britain and on the continent for great proficiency in mathematical knowledge, and power and versatility of mind, having already written various valuable treatises on capillary action, on the vibration of a string, on music, etc. In 1716 he visited Paris, and was received with warm demonstrations of regard by the French savans, who respected his ability and learning, and the prominent and distinguished part he had taken in the Leibnitzian controversy. On his return to England in 1717 he resumed his habits of severe study, but was forced by declining health to resign the secretaryship in 1718. For the next three years he wandered about, residing now on the continent, now in England. He died, Dec. 29, 1731, at the age of 46. Besides his earlier works above mentioned, he contributed a series of able papers on higher algebra, dynamics, and general physics, published separately his *Methodus Incrementorum* in 1715, and a *Treatise on Linear Perspective*, the first general exposition of this subject, in 1719. During the last ten years of his life he gave himself up almost entirely to metaphysical and biblical studies. His *Methodus Incrementorum* contains, besides the famous "theorem" (see TAYLOR'S THEOREM), the first germs of the calculus of finite differences, various now common forms of infinitesimal series, with mechanical, physical, and algebraical applications. The chief use made by Taylor of his theorem is in a paper (1717) entitled "Method of Approximation to the Roots of Equations." The results of his investigations may be found in the *Phil. Trans.* (1713-23), and in his two works above mentioned.

TAYLOR, EDWARD T., 1793-1871; b. Va.; was a sailor in his youth; was captured on a privateer in the war of 1812; in prison at Dartmoor, England, and chaplain to the prisoners; was ordained a preacher in connection with the New England Methodist Episcopal conference, 1819; became minister of the Seamen's Bethel, 1828. He was greatly distinguished as the sailor's preacher, and had great influence over his rough auditors by his warmth of heart, native wit, and natural eloquence. His common designation was "Father Taylor." He visited Europe in 1832 and Palestine in 1842; was chaplain to the U. S. frigate sent with relief to Ireland during the famine in 1846.

TAYLOR, GEORGE, 1716-81; b. Ireland; received a fair education, and emigrated to the United States in 1736. He was at first a common laborer in a Pennsylvania foundry, but quickly rose, and in time became a large proprietor of iron foundries in Northumberland county. In 1764 he was chosen a member of the colonial assembly, and later served in the provincial assembly for five years. He was active in aiding the movement which led to the revolution, and in 1776 became a member of the continental congress. He signed the declaration of independence.

TAYLOR, SIR HENRY, D.C.L., b. Middleham co., Durham, Eng., 1800; entered the colonial office, 1824, and was promoted to a senior clerkship, 1825. In 1873 he was knighted, in recognition of his long public services. He published *Isaac Comnenus*, a drama, 1827, which attracted little attention, but, 1834, he rose to sudden fame on the appearance of *Philip Van Artevelde*, one of the noblest historical dramas of the century. His later works have hardly added to his laurels. They include dramas, poems, and prose essays, published in the following order: *The Statesman*, 1836; *Edwin the Fair*, an Historical Drama, 1842; *The Eve of the Conquest, and Other Poems*, 1847; *Notes from Books, in Four Essays*, 1849; *The Virgin Widow, a Comedy*, 1850; *St. Clement's Eve, a Play*, 1862; *A Sicilian Summer, and Minor Poems*, 1868. An *Autobiography* of the veteran author appeared in 1885. He died in 1886.

TAYLOR, ISAAC, 1759-1829; b. London; originally a line-engraver, he removed from the metropolis, 1786, to Lavenham, Suffolk, to pursue his profession and train his children in a quiet country town; became minister of an Independent church, Colchester, Essex, 1796-1810, and at Ongar from 1810 until his death. Among his publications were many on educational subjects.

TAYLOR, ISAAC, b. at Lavenham, in Suffolk, 1787, d. at Stanford Rivers, in Essex, 1865, eminent as a Christian philosopher, artist, and mechanic, was the third of his name who attained distinction—his grandfather and father (known as Isaac Taylor of Ongar) being both named Isaac, and each in his way distinguished. Charles Taylor, the editor of *Calmet*, was an uncle, and Jane Taylor (author of the *Q. Q. Papers*) and Ann Taylor (Mrs. Gilbert of Nottingham), joint-authors of *Hymns for Infant Minds*, were sisters of the subject of this article. The literary career of Isaac Taylor extended over nearly half a century. It began in 1818, in contributions to the *Eclectic Review*, for which Robert Hall, John Foster, and Josiah Conder then wrote, and ended in 1865, in contributions to *Good Words*, in which the name of the veteran figured with those of men who were unborn when he was in the height of his reputation. Between 1822 and 1827 he published *Elements of Thought; Characters of Theophrastus*, with illustrations, etched by himself; *The History of the Transmission of Ancient Books to Modern Times; The Process of Historical Proof*, a translation of Herodotus, and the *Memoirs and Correspondence of Jane Taylor*, his sister, who has already been mentioned. In 1829 he published, anonymously, *The Natural History of Enthusiasm*, which ran rapidly through several editions; and between 1829 and 1836 he published in succession *Fanaticism*,

Spiritual Despotism, Saturday Evening, and The Physical Theory of Another Life. In 1836 appeared *Home Education*. Thereafter he was a long time occupied upon a new translation of Josephus, undertaken jointly with the Rev. Dr. Traill, and which was illustrated by etchings executed by himself. Within the last 13 years of his life appeared *Loyala, Wesley, The Restoration of Belief, Logic of Theology, Ultimate Civilization, and The Spirit of Hebrew Poetry*. Besides these numerous works, Isaac Taylor wrote many articles for the graver quarterly reviews, which are as yet uncollected. He had been educated as an artist, and some of his designs, executed before he betook himself chiefly to literature, have evoked the warmest praise from the most scrupulous critics, who have wondered how one with such a genius for art could have deserted it. It would be impossible to give here any account that would be intelligible of his numerous mechanical inventions; it must suffice to say that, by two of his inventions, he revolutionized the art of calico-printing. Isaac Taylor married in middle life, and had a large family, whose home education, as liberal-minded but pious Christians, was among, and not one of the least of, the tasks of his life.

TAYLOR, The Rev. ISAAC, M.A., canon of York Minster since 1875, the eldest son of the preceding, was b. at Stanford Rivers, May 2, 1829. He is the author of *The Liturgy and the Dissenters*, and one or two other theological pamphlets; but has best maintained the literary distinction of his family by his works on philology. His *Words and Places, or Etymological Illustrations of History, Ethnology, and Geography* (1864), of which a second edition revised and enlarged, was published in 1865, is a work of great research as well as erudition, and has done more toward the elucidation of the local names of English places than any book yet published. In *Etruscan Researches* (1874) Taylor tries to prove that the Etrurians were allied to the Turkish or Mongolian races. This proposition, however, is not well established, and the work has received severe handling from critics, especially from Prof. Max Müller. In 1876 Taylor published *The Etruscan Language*; in 1883, his great work on *The Alphabet*; in 1890, *The Origin of the Aryans*; in 1896, *Names and their Histories*.

TAYLOR, ISIDORE SÉVERIN JUSTIN, Baron, b. Brussels, 1789; studied art and became a writer and artist. Politically he sided with the Bourbons, and served in the Spanish campaign of 1823. The obelisk of Luxor now in the *Place de la Concorde*, Paris, was brought from Egypt by him. Baron Taylor also acted as purchaser of pictures for many of the great French collections, was a grand officer of the legion of honor, and he wrote several dramas and treatises on art and kindred subjects. He d. 1879.

TAYLOR, JEREMY, one of the greatest names in the English church, was the son of a Cambridge barber, and was born in that town, Aug. 15, 1613. At the age of 13 he entered Caius college as a sizar, and after seven years' strenuous and brilliant study in classics and theology, took the degree of M.A. Like Archbishop Usher, he was admitted to holy orders before he had reached his 21st year. Soon after, he attracted the notice of Laud (who had a regard for learning, if none for liberty), and was preferred by him to a fellowship at All Souls, Oxford (1636). About the same time, he was appointed chaplain in ordinary to the king; and in 1638, rector of Uppingham, a preferment which he retained till the successes of the parliamentarians deprived him of it. The first notable publication of Taylor's was a defense of the church, entitled *Episcopacy asserted* (Oxford, 1642). It procured for him the honor of D.D. During the next three years, Taylor probably accompanied the royal army; but when fortune had unmistakably declared against the king he withdrew into Wales (1645-46), and, in conjunction with Mr. W. Wynt of St. John's college, Oxford, opened a school at Newton, in Caermarthenshire. It appears to have been a pretty successful adventure, and many of his scholars, we are told, "having, as it were, received instruction from this prophet in the wilderness, were transplanted to the universities." Taylor also found a patron in the earl of Carbery, who was then living at the family seat of Golden Grove, in the same county, and who appointed him his domestic chaplain. But if this period of Taylor's life had become to the outward eye obscure and mean, it is rendered illustrious by the splendor of his literary achievements. Between 1647 and 1660, the long 13 years of his enforced seclusion, appeared all his great works, and remembering their unsurpassed merits, we are almost disposed to feel grateful to those who expelled him from his rectory, and drove him to strictly literary pursuits. In 1647, was published the *Liberty of Prophesying*, a work written on behalf of the clergy of the church of England, who were being expelled from their livings by the victorious Puritans, but in which the pleadings are based on principles far more comprehensive and tolerant than the age was disposed to acknowledge; in 1649, the *Life of Christ* (2 vols.), one of the most popular of his productions, and *The Rule and Exercises of Holy Living*; in 1651, *The Rule and Exercises of Holy Dying*, a portion of his *Sermons*, and the *Discourse of the Divine Institution, Necessity, and Sacredness of the Office Ministerial*; in 1652, a *Discourse on Baptism, its Institution, and Efficacy upon all Believers*; in 1653, 25 additional *Sermons*; in 1654, *The Presence Real and Spiritual of Christ in the Blessed Sacrament*; in 1655, *The Guide of Infant Devotion, or the Golden Grove*, and the *Unum Necessarium, or the Doctrine and Practice of Repentance*, a decidedly Pelagian treatise, which involved him in a considerable controversy; in 1657, a *Collection of Polemical and Moral Discourses, a Discourse on Friendship*, etc.; and in 1660, his famous *Ductor Dubitantium, or the Rule of Conscience in all her General Measures*, the most learned,

subtle, and curious of all Taylor's works. It was dedicated to Charles II. He was a stanch royalist, a splendid scholar, a consummate theologian, and a man of wonderful literary genius, and so it was in the nature of things almost impossible that he should escape preferment. Before 1660 had expired, he was elevated to the bishopric of Down and Connor, a dignity which he only retained some seven years, dying Aug. 13, 1667. Taylor was not happy in his Irish see. Before a year was over, he was anxious to be delivered from it as from a "place of torment." The Scotch Presbyterian ministers were "incendiaries"—they robbed him of the "people's hearts;" they even "threatened to murder" him; his only hope was in the government and the military. Altogether, it is a melancholy spectacle to behold the finest ecclesiastical genius of the time half broken-hearted by petty squabbles with intolerable fanatics, who had, nevertheless, in the points at issue between them and Taylor, something like justice on their side. No modern mind would hesitate for an instant to acknowledge that the Scots-Irish Presbyterian clergy were perfectly entitled to act as they did, and yet we fear it is too plain that the good bishop would have gladly seen them prohibited by an Episcopalian soldiery. Nay, the author of the *Liberty of Prophesying* went a step further; and on one occasion, only three months after his consecration, actually deposed 36 Presbyterian ministers occupying livings which the restoration had inconsiderately and tyrannically declared to be Episcopalian. Some very interesting information in regard to this all but unknown period of Taylor's life is to be found in *Notes and Queries* (Nov. 11, 1865).

Taylor, sometimes styled the modern Chrysostom (q.v.), on account of his golden eloquence, has no equal in the whole series of ecclesiastical writers for richness of fancy. All other divines—patristic, mediæval, and modern—show poor and meager beside him in this respect. Some are more logical, or penetrating, or profound; some grasp more clearly the spiritual significance of doctrine, or display a deeper knowledge of human nature; but Taylor ranks among the first men of his age in point of learning, subtlety of argument, elevation of devout feeling, and philosophic largeness of view, while his inexhaustible imagery, shining "like the glossy purples of a dove's neck," and full of all tender and pathetic beauty, reminds us of Spenser and Shakespeare, of Sidney and Fletcher, rather than of the somber order of theologians.—The best edition of Taylor's works is by the Rev. C. P. Eden, M.A., fellow of Oriel college, Oxford (10 vols., London, 1854).

TAYLOR, JOHN, 1580-1654; b. England a waterman on the Thames, commonly called "the water poet." He tells, in *The Pennyless Pilgrimage, or the Moneyless Perambulation of John Taylor, alias the King's Majesty's Water Poet*, "how he traveled on foot from London to Edinburgh, not carrying any money to or fro, neither begging, borrowing, or asking meat, drink, or lodging." He complains of his treatment in these frolics in his *Scourge for Baseness*. He collected in 1630 *All the Works of John Taylor, the Water Poet*.

TAYLOR, JOHN, b. in Orange co., Va., 1750; d. 20 Aug., 1824. He was educated at William and Mary College; was the successor to Richard Henry Lee in U. S. Senate, 1792, and resigned 1794. In 1797 he was presidential elector, U. S. Senator in 1803, and 1822-24. In 1798-99 he was a member of the Virginia House of Delegates, and was the mover of the celebrated "Resolutions of '98," drawn by Mr. Madison, the principles of which Taylor consistently and powerfully supported throughout his life. He wrote *An Inquiry into the Principles and Policy of the Government of the United States*; *Arator*; a series of *Agricultural Essays, Practical and Political*; *Construction Construed, and the Constitution Vindicated*; *Tyranny Unmasked*; *New Views of the Constitution of the U. S.* He was one of the ablest and purest of American statesmen, but was so ardently devoted to agriculture that it was with difficulty that he was withdrawn from its pursuits into public life. Mr. Jefferson considered his works indispensable to the library of the statesman or the philosopher.

TAYLOR, NATHANIEL WILLIAM, D.D., 1786-1858; b. Conn.; graduated at Yale college, 1807; studied theology five years with Dr. Dwight; ordained pastor of the First church (Congregational), New Haven, 1812, as successor of Moses Stuart; elected Dwight professor of didactic theology in Yale college, 1822, holding the position till his death, having in 36 years given instruction to 700 students preparing for the ministry. While a pastor he wrote a series of articles for the *Monthly Christian Spectator* on the Unitarian controversy. In 1828 he preached in New Haven the *concio ad clerum*, presenting views on native depravity which were denounced as heretical, and led to a protracted discussion between him and Dr. Tyler. After his death, four volumes of his works were edited by President Noah Porter: *Practical Sermons*; *Lectures on the Moral Government of God*, 2 vols.; *Essays, Lectures, etc., upon Select Topics in Revealed Theology*. The views for which he was attacked would now scarcely give rise to any controversy. He was a man of acute intellect and deeply evangelical spirit.

TAYLOR, RICHARD, b. Louisiana, 1826; son of President Zachary Taylor. He graduated at Yale, 1845; joined the confederate army, and commanded a Louisiana regiment at the battle of Bull Run. He served under Jackson in Virginia, with Kirby Smith in the trans-Mississippi department, and defeated Banks in the latter's Red River expedition. In 1864, then ranking as maj.-gen., he took command of the east Louisiana department, and surrendered in 1865 to Gen. Canby. He was a brother-in-law of Jefferson Davis. He pub. *Destruction and Reconstruction* (1879). He d. 1879.

TAYLOR, SAMUEL HARVEY, LL.D., 1807-71; b. New Hampshire; graduated at Dartmouth, 1833, and Andover Theological Seminary, 1831; tutor at Dartmouth, 1836-37; principal of Phillips Academy, Andover, until his death. He was unsurpassed for thoroughness as a classical teacher. From 1852 he was one of the editors of the *Bibliotheca Sacra*. Among his publications are: *Methods of Classical Study*; *Krebs' Method for Writing Latin*, from the German; *Kühner's Elementary Grammar of the Greek Language*, from the German; *Memoir of the Rev. Edward L. Parker*.

TAYLOR, STEPHEN WILLIAM, LL.D., 1791-1856; b. Mass.; graduated at Hamilton college, 1817; taught the Black River academy at Lowville, N. Y., 14 years; teacher of a private school 3 years; took charge in 1834 of the preparatory department of Hamilton institution; was professor of mathematics and natural philosophy there, 1838-45; was its president after it was organized as Madison University in 1851.

TAYLOR, TOM, 1817-80; b. England; educated at Glasgow and Cambridge. He was for two years professor of the English language and literature at University College, London; was afterward called to the bar, and for the next 21 years held various government offices. He was the author of nearly 100 dramatic pieces, among the most popular of which are; *Still Waters Run Deep*; *The Overland Route*; *Victims*; *Twixt Ace and Crown*; and *The Ticket-of-Leave Man*. He was a frequent contributor in prose and verse to *Punch*, of which he was some time editor.

TAYLOR, WILLIAM J. R., D.D., b. N. Y., 1823; son of Dr. Benjamin C.; graduated at Rutgers College, New Jersey, 1841, and at the theological seminary of the Reformed Church, New Brunswick, 1844; pastor of Reformed Church, New Durham, N. J., 1844-46; Jersey City, 1846-49; Schenectady, 1849-52; Third Reformed church, Jersey City, 1852-54; Third Reformed Church, Philadelphia, 1854-62; corresponding secretary American Bible Society, 1862-69; pastor Clinton Street Reformed Church, Newark, N. J., 1869; President of General Synod of Reformed church, 1871; editor-in-chief of *The Christian Intelligencer*, 1872-76. His church in Newark is one of the leading churches in the city.

TAYLOR, WILLIAM MACKERGO, D.D., b. Scotland, 1829; graduated at University of Glasgow, 1849; studied theology in Edinburgh; ordained pastor of the United Presbyterian Church at Kilmaurs, 1853; pastor of the United Presbyterian Church at Derby Road, Liverpool, 1855; came to the United States, 1871, as delegate of the United Presbyterian Church of Scotland to the General Assembly of the Presbyterian Church at Chicago; became pastor of the Broadway Tabernacle Church (Congregational), New York, 1872. He received the degree of D.D. from Yale College and Amherst the same day. He published *Life Truths*; *The Miracles*; *Helps to Faith, not Hindrances*—a reply to Renan's *Life of Jesus*; *The Lost Found, and Wanderer Welcomed*; *Memoirs and Remains of Rev. M. Dickie*, Bristol; *David, King of Israel*; *Elijah the Prophet*; *The Ministry of the Word*. He delivered a course of lectures in Yale divinity school on the "Lyman Beecher foundation." His preaching drew a large and attentive congregation. He died in 1895.

TAYLOR, WILLIAM ROGERS, b. R. I., 1811; entered the U.S. navy in 1828. During the Mexican War he was on the sloop *St. Mary's*, and took part in the engagement at Tampico Bar, and the siege of Vera Cruz. He served in the war of the secession, participated in the attacks on Forts Wagner and Sumter, 1863, and afterward in the attacks upon Fort Fisher. He was made rear-admiral in 1871. He d. 1889.

TAYLOR, ZACHARY, 12th president of the United States, was born in Orange co., Va., Nov. 24, 1784, son of Col. Richard Taylor, an officer of the war of independence, and one of the first settlers of Louisville, Ky., where Taylor was taken in early childhood, and grew up to his 24th year, working on a plantation, with only the simplest rudiments of education. His elder brother had received a lieutenancy in the army, and died in 1808, when Taylor was appointed to the vacant commission. In 1810 he was promoted to a captaincy; and in 1812, with 50 men, two-thirds of whom were ill of fever, he defended Fort Harrison, on the Wabash, against a large force of Indians led by the famous chief Tecumseh. Promoted to the rank of major for his gallantry, he was employed during the war in fighting the Indian allies of Great Britain. In 1822 he built Fort Jesup; in 1832 he served as colonel in the Black Hawk War; and in 1836 was ordered to Florida, where he gained an important victory over the Seminole Indians at Okeechobee, for which he was appointed brigadier general, and made commander of the United States forces in Florida. In 1840, having been appointed to the command of the southwestern department, he purchased an estate at Baton Rouge, Louisiana. On March 1, 1845, the U. S. congress passed the resolution for the annexation of Texas, formerly a province of Mexico, and for some time an independent republic. Texas claimed the Rio Grande for her southwestern boundary; Mexico insisted that there could be no claim beyond the Nueces, and prepared to defend the disputed, if she could not reconquer the whole territory. Gen. Taylor was ordered to Corpus Christi, which point he occupied in Nov. with a force of 4,000. On Mar. 8, 1846, he moved toward the Rio Grande, across the disputed territory, and built Fort Brown, opposite and commanding the Mexican port of Matamoras. Gen. Ampudia, the Mexican commander, demanded that he should retire

beyond the Nueces, pending negotiations; and on the refusal of Gen. Taylor, his successor, Gen. Arista, crossed the Rio Grande with a force of 6000. On May 8, he was defeated at Palo Alto by Gen. Taylor, with a force of 2300; and a few days after, driven from a new position at Resaca de la Palma, across the Rio Grande. War was declared by congress to exist by the act of Mexico; 50,000 volunteers were called for. Taylor made maj.-gen., re-enforced, and ordered to invade Mexico. On Sept. 9, with 6625 men, he attacked Monterey, which was defended by about 10,000 regular troops. After 10 days' siege and 3 days' hard fighting, it capitulated. Gen. Scott having been ordered to advance on the city of Mexico by Vera Cruz, withdrew a portion of the troops of gen. Taylor, leaving him only 5000 volunteers and 500 regulars, chiefly flying artillery, to meet an army of 21,000, commanded by President Santa Anna. He took a strong position at Buena Vista, fought a desperate battle, and won a decided victory. This victory, against enormous odds, created the utmost enthusiasm; and Gen. Taylor, popularly called "Old Rough and Ready," was nominated for president of the United States over Henry Clay, Daniel Webster, and Gen. Scott; and this "ignorant frontier col., who had not voted for 40 years," and was a slaveholder, was triumphantly elected over Gen. Cass, the democratic, and Martin Van Buren and Charles Francis Adams, free soil candidates. Entering upon the presidency in 1849, he found a democratic majority in congress, with a small but vigorous free-soil party holding the balance of power, while the most exciting questions connected with the extension of slavery, as the admission of California, the settlement of the boundaries of Texas, the organization of the newly-acquired Mexican territories, etc., were agitating the country, and threatening a disruption, postponed by the compromises introduced by Mr. Clay. Worn down by the unaccustomed turmoil of politics, the rough, good-natured old soldier did not long enjoy his honors. On July 4, 1850, 16 months after his inauguration, he was attacked with bilious colic, and died on the 9th.

TAYLOR'S THEOREM, so called from its discoverer, Dr. Brook Taylor (q.v.), is a general method for the algebraic development of a function of a quantity, x , in powers of its increment h , and may be thus briefly explained and illustrated: Let $f(x+h)$ denote *any* function of $x+h$ (subject to the limitations below), then $f(x+h) = f(x) + f'(x)h + f''(x)\frac{h^2}{1.2} + f'''(x)\frac{h^3}{1.2.3} + \dots$, where $f(x)$ is the same function of x , as $f(x+h)$ is of $x+h$, and $f'(x)$, $f''(x)$, etc., are the first, second, etc., differential coefficients of $f(x)$. By a supplementary theorem, due to Lagrange, who was the first to appreciate to the full the value of Taylor's discovery, it was shown that the sum of all the terms of the series after n terms, could be represented by $f^n(x+\theta h)\frac{h^n}{1.2\dots n}$, where θ is some positive fraction less than unity. The theorem supposes that between certain limits, indicated by $h=0$, and h = some finite quantity, neither $f(x)$ nor any of its derived functions vanish, or all of them do not become infinite; and the cases in which these conditions are not satisfied are often spoken of as instances of the "failure of Taylor's theorem." An important particular case of this theorem, known as *Maclaurin's*, or (more properly) *Stirling's Theorem*, was independently discovered; it is that case of the general theorem in which the various functions of x are made functions of zero, and is written $f(0+h) = f(0) + f'(0)h + f''(0)\frac{h^2}{1.2} + \dots$. The best illustrations of these theorems are the binomial, exponential, logarithmic, and circular series; thus if the function be $(x+h)^a$, then $f(x) = x^a$, $f'(x) = ax^{a-1}$, $f''(x) = a(a-1)x^{a-2}$, etc.; and by substitution of these values we obtain Newton's *binomial* theorem; if the function be $a^x + h$, Taylor's series gives us as its equivalent $a^x(1 + h \cdot \log. a + \frac{h^2}{1.2} \log. a^2 + \dots)$; and Maclaurin's gives $a^h = 1 + h \cdot \log. a + \frac{h^2}{1.2} (\log. a)^2 + \dots$, which latter is the *exponential* theorem, and may be obtained from Taylor's series by division; if the function be $\log. (1+x+h)$, ($\log. \frac{x+h}{x}$ being one of the cases in which Taylor's theorem fails), then Maclaurin's series gives the *logarithmic* theorem, $\log. (1+h) = h - \frac{h^2}{2} + \frac{h^3}{3} - \dots$; and the same theorem gives the various series expressing the values of $\sin. h$, $\cos. h$, $\sin. -h$, etc., etc. The history of this celebrated theorem is remarkable. On the first publication of the *Methodus Incrementorum*, it was entirely neglected by Leibnitz, who, in ignorance of its value, severely criticised the whole work; while the bitter hostility of John Bernoulli to British men of science, blinded him to the existence of any merit in any part of the work. The theorem never appeared in any of the works on the calculus published before D'Alembert's *Recherches*, and after that was given only in the French *Encyclopædia*; but neither D'Alembert nor Condorcet seems to have known that it was Taylor's, or to have fully appreciated its importance; and it was not till Lagrange, in the *Berlin Memoirs* for 1772, gave the name of its true author, and proposed to make it the foundation of the differential calculus, that it assumed that important position which it deserved to hold.

TAZEWELL, a co. in central Illinois, drained by the Mackinaw and Illinois rivers, the latter its n. boundary; traversed by the Chicago and Alton, the Toledo, Peoria, and Western, the Cleveland, Cincinnati, Chicago, and St. Louis, and other railroads; about 650 sq. m.; pop. '90, 29,556, chiefly of American birth. Co. seat, Pekin.

TAZEWELL, a co. in s.w. Virginia, adjoining West Virginia; drained by the Clinch, Bluestone, and Holston rivers; 536 sq. m.; pop. '90, 19,899, chiefly of American birth. Co. seat, Tazewell.

TAZEWELL, HENRY, 1753-99; b. Va.; after graduating from William and Mary college, studied law and practiced successfully in his native state. From 1775 to 1785 he was a member of the Virginia house of burgesses, and served on the committees which drew up the declaration of rights and state constitution. He was for many years a judge of the supreme court and court of appeals. In 1793 he was chosen U. S. senator, and in 1795 was president *pro tem.* of the senate.

TAZEWELL, LITTLETON WALLER, 1774-1860, was born in Williamsburg, Va. He graduated at William and Mary College in 1792; studied law and began practice in 1796. He was also elected to the state legislature in 1796, and served four years, when he was elected to Congress. In 1802 he declined re-election, and returned to his profession, where he gained exceptional distinction in criminal and admiralty law. In 1819 he was appointed commissioner for the purchase of Florida, and in 1824-'33 was in the U. S. Senate, where his speeches attracted much attention. In 1829 he declined the mission to England; was a strong opponent of nullification in 1831-'32; in '33, resigned his seat on account of his disgust with various measures; and in 1834-'36, was governor of his native state. His principal published work is a *Review of the Negotiations between the United States and Great Britain regarding Commerce* (1829). The character of "Sidney" in Wiat's *Old Bachelor* is said to be a sketch of Tazewell by his friend, the author.

T CART. Also written Tay-Cart. A kind of wagon intended for pleasure driving. It has two seats and is much used by people of fashion.

TCHAD, or TSAD, LAKE, a large lake in Soudan, northern Africa, lat. 12° 30' to 14° 30' n., long. 13° to 15° 30' east. Its size varies with the time of year; it has an area of 10,000 sq.m. in the dry season, and is sometimes four or five times as large in the rainy months. According to Rohlf's it is 1150 ft. above sea-level. The shores are low, and for the most part unattractive; and a strip of swampy ground surrounds the fine open sheet of water which is the actual Tchad, and the margin of which is lined by papyrus and tall reeds, of from 10 to 14 ft. in height.

TCHERNAIEFF, MICHAEL GREGOROVITCH, a Russian general, was born Oct. 24, 1828. He entered the military service in 1847, distinguished himself in the Crimean war, at its close was appointed chief of the staff of a division in Poland, and in 1858 was sent to Orenburg, where for some time he acted as chief of staff. Next he marched from Orenburg across the steppes of Turkestan and effected a junction with another division under Col. Verevkin, in the vicinity of the town of Tchemkend, then occupied by the Khokanians. This town Tchernaiëff took by assault in Oct., 1864, and the city of Tashkend in June, 1865. He had disobeyed orders in taking Tashkend, and although on his return to St. Petersburg he was enthusiastically received, he was from that time not actively employed in the Russian service, and retired from the army, resuming his rank only upon the Imperial request. After a year of inactivity he again retired, and purchased the *Ruski Mir*, a journal which boldly advocated Slav interests, of which he became the recognized editor in 1874. When, in 1875, the insurrection in Herzegovina broke out, he opened a subscription in its behalf, and in 1876 went to Belgrade and took the command-in-chief of the Servian army. His proclamation of Prince Milan as king of Servia was much censured at the time as a foolish act. General Tchernaiëff left St. Petersburg for Tashkend in 1882 to assume the government there, but his aggressive policy, which seemed likely to cause complications with Great Britain, led to his recall to St. Petersburg in 1884, where he became a member of the Council of War. In 1886 he was removed from office on account of indiscreet publications, but was replaced in 1890.

TCHERNIGOV', a government in s.w. Russia, drained by the Dnieper and the Desna rivers; about 20,000 sq. m.; pop. '94, 2,335,835. The surface is generally level. The soil is extremely rich. Capital, Tchernigov on the Desna, with pop. '94, 27,871.

TCHUKTCHEES, a wandering tribe in Siberia, supposed to be kin to the Koriaks, living near Behring strait.

TEA, *Thea*, a genus of shrubs of the natural order *ternstroemiaceæ*, closely allied to the genus *camellia* (q.v.), and distinguished from it only by the not deciduous calyx, and by the dissipiments remaining connected in the center of the capsule after it opens. The genus seems to derive its importance entirely from a single species, the dried leaves of which are the tea of commerce, one of the most important articles of commerce in the world, and yielding the most esteemed and extensively used of all non-alcoholic beverages. This species, the tea shrub or CHINESE TEA (*T. sinensis*), is 20 to 30 ft. high, but in a state of cultivation only 5 to 6 ft. high, with numerous branches and lanceolate leaves, which are 2 to 6 in. long. The flowers grow singly or two or three together in the axils of the leaves; they are rather large, white, and fragrant, with 5-parted calyx, 6 to 9 petals, and

many stamens. By cultivation for many centuries, numerous varieties of this plant have been produced in China, some of which have been reckoned as distinct species, particularly *T. viridis*, formerly supposed to yield green tea, *T. Bohea*, formerly supposed to yield black tea, and *T. stricta*. Of these, the first-named has the longest, and the last has the shortest leaves.

The cultivation of tea in China is chiefly confined to the regions between n. lat. 24° to 35° and e. long. 115° to 122°. Tea for domestic use is, however, cultivated both in more southern and more northern regions. The plant is to be accounted subtropical, but bears a tropical climate well, and can also accommodate itself to cold winters. In the neighborhood of London it often endures all the frost of winter without protection. In few of the countries into which it has been introduced, however, is the flavor of the dried leaf such as it is in China. The use of tea is said to have been introduced into China itself from the Corea about the 4th c. of the Christian era, and to have extended to Japan about the 9th century. The Chinese cultivate it chiefly on the southern slopes of hills. A new plantation is made by sowing the seed in holes at proper distances, two or three seeds being put into a hole to secure a plant. The first crop is obtained in the third year, when the shrub is by no means full-grown. When about seven years old, it yields only a scanty crop of hard leaves, and is cut down, when new shoots rise from the root, and bear fine leaves in abundance. This is repeated from time to time, till the plant dies at about the age of thirty years.

History and Commerce.—All that can be affirmed regarding the early history of this beverage is, that it appears to have been used for ages in China, where it is believed by the natives to be indigenous. It first became known to Europeans at the end of the 16th c., though it is only mentioned by the Portuguese writer Maffei in his *Historia Indica*, who refers to it as a product both of China and Japan. The first reference to it by a native of Britain is in a letter dated June 27, 1615, written by a Mr. Wickham, which is in the records of the East India company; and it is curious to observe that both the Portuguese and English writers referred to use their own rendering of the native name, which is *tcha*. Maffei calls it *chia*, and Mr. Wickham, *chaw*. From this time, it became gradually known to the wealthy inhabitants of London, in the form of occasional presents of small quantities from India, obtained from China, or by small lots in the markets from time to time, but always exorbitantly dear, fetching sometimes as much as £10 the lb., and never less than £5. A rather large consignment was, however, received in 1657; this fell into the hands of a thriving London merchant, Mr. Thomas Garraway, who established a house for selling the prepared beverage; and that house, under the name of "Garraway's coffee-house," is still a famous establishment in that city. From 1660 until 1689, a duty was levied on the drink made with tea at the rate of 8d. per gallon; but from the latter date a duty of 5s. per lb., with an addition of 5 per cent *ad valorem*, was levied. For many years, the duties, although occasionally changed, were always very high, and were levied by both the customs and the excise. The expiration in 1833 of the charter of the East India company, which had held a complete monopoly of the tea-trade, produced a change; the *ad valorem* duty was abolished, and differential duties of 1s. 6d., 2s. 2d., and 3s. per lb. were substituted; but they worked badly, and were abandoned in 1836 for one uniform rate of 2s. 1d. per lb., to which, in 1840, was added an additional 5 per cent.

Much mystery and error for a long time existed upon the subject of the species producing the tea of commerce. By many it was said that the qualities known as black teas were produced by the species known to botanists as *T. Bohea*, and the green teas from *T. viridis*. Others held that only one species was used to make both the black and green varieties, and that the difference arose from the method and time of preparation. The eminent botanical traveler, Mr. Robert Fortune, has, however, entirely set the question at rest by investigating the matter on the spot. He found that in the Canton district, where black teas alone are prepared, only the *T. Bohea* is grown; while in the province of Che-kiang only *T. viridis* is grown, and green teas made. But the cultivation of the latter plant he also found to be absolutely universal in the Fokien district, although the inhabitants make only black teas. The tea-farms are mostly in the n. of China, and are usually of small size, and require much attention: for the plant will only thrive in well manured or very rich soil, and the spaces between the plants, which are 4 ft. apart, must be kept in good order, and free from weeds. The farms always occupy the hill-sides, where the soil is deep and well drained. Although an evergreen, the leaves can only be gathered at certain seasons: the first is in April, when the new leaves begin to burst from the buds; and some of these in their most tender state are gathered and made into young hyson of the finest quality; so fine, indeed that it has rarely been brought to England, because it is said to lose flavor by the sea-voyage. Much is, however, sent overland to Russia, where it fetches an exorbitant price. The ordinary picking begins just after the summer rains are over, at the beginning of May; and later in the season, a third picking takes place, the produce of which is inferior, and used only by the poorer classes of the country. The later gatherings are more bitter and woody than the earlier, and yield less soluble matter to water. The leaves, when freshly plucked, possess nothing of the odor or flavor of the dried leaves, these properties being developed by the roasting which the leaves undergo in the process of drying. Moreover, different qualities of tea are prepared from the same leaves, which may be made to yield green or black teas at will.

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TEA, COFFEE, ETC.—1. Tea (*Thea viridis*). 2. Cocoa (*Theobroma cacao*). 3. Lemon (*Citrus aurantium*). 4. Orange (*Citrus aurantium*). 5. Coffee (*Coffea Arabica*). 6. Orange (*Citrus aurantium*). 7. Coffee (*Coffea Arabica*). 8. Pomegranate (*Punica granatum*). 9. Pomegranate (*Punica granatum*). 10. Pomegranate (*Punica granatum*). 11. Vanilla (*Vanilla planifolia*). 12. Vanilla (*Vanilla planifolia*).



3. *Cinnamomum zeylanicum*. 4. Cinnamon (*Cinnamomum zeylanicum*). 5. Tamarind (*Tamarindus Indica*). 6. Pomegranate (*Punica granatum*). 7. Olive (*Olea Europæa*). 8. Quince (*Cydonia vulgaris*). 9. Spanish pepper (*Capnoselinum*).

For a description of the specific processes for obtaining the green and the black teas generally, we refer to Mr. Fortune's work (*Tea Countries of China*), or to Johnson's *Chemistry of Common Life*, vol i, p. 161, in which it is quoted. It is sufficient here to remark, *first*, that, in the process of drying, the leaves are roasted and scorched in such a way as necessarily to induce many chemical changes in them; the result of such changes being to produce the varieties of flavor, odor, and taste by which the different kinds of teas are distinguished; and *secondly*, that the different colors of green and black teas are due to the mode in which the leaves are treated. For *green teas* the leaves are roasted in pans almost immediately after they are gathered. After about five minutes' roasting, during which they make a cracking noise, become moist and flaccid, and give out a good deal of vapor, they are placed on the rolling-table, and rolled with the hands. They are then returned to the pans, and kept in motion by the hands: in about an hour, or rather more, they are well dried, and their color, which is a dull green, but becomes brighter afterward, has become *fixed*. The essential part of the whole operation is now over, nothing more being required than to sift and re-fire it. For *black teas*, the leaves are allowed to be spread out in the air for some time after they are gathered; they are then further tossed about till they become flaccid; they are next roasted for a few minutes, and rolled, after which they are exposed to the air for a few hours in a soft and moist state; and lastly they are dried slowly over charcoal fires, till the black color is fairly brought out. Hence the dark color and distinguishing flavor of black tea seem due to the long exposure to the atmosphere in the process of drying, and the oxygen of the air acting rapidly upon the juices of the leaf, and especially upon the astringent principle during this exposure. For the purpose of giving special scents to different varieties of tea, numerous odoriferous plants are employed in different parts of China; the cowslip-colored blossoms of the sweet-scented olive (*olea fragrans*) communicate an especially fragrant scent to tea.

The adulteration of tea, when the duty was very high, was probably carried on to a great extent; but notwithstanding the terrible tales of alarmists, it may be asserted that very little adulteration of tea is now carried on in this country. In China, spurious teas have been prepared and sent to this country under the name of "lie teas," but they had no sale, and of course were discontinued. The Chinese give an artificial coloring to the green teas sent to Europe because it pleases the eye, but the coloring matter is very innocuous, and is never produced by heating over copper plates—a popular error, which has been persisted in for a long time without a shadow of truth for its foundation. Prussian blue in very minute proportion, and a species of native indigo and gypsum, are the real materials employed for giving the face, as it is called.

In 1836 the culture of tea was attempted on a large scale in India, under the direction of the able and indefatigable botanists, Dr. Royle and Dr. Falconer; and after some difficulty, a good supply of plants was introduced to the districts of Kumaon and Gurhwal, and in the mean time plantations formed at an earlier period in Assam were making great progress. From these sources a steadily increasing supply is received, the value of which in 1880 was \$15,364,610. The quality, too, is superior to many of the Chinese teas, a fact which is testified by the large quantity of Indian teas now used. The only other country which has grown tea successfully is Brazil, where, in the high lands, tea of the most excellent quality is produced, and in sufficient quantities to supply a large portion of the Brazilian demand.

The varieties of tea are very numerous; the following are among those found in the shops of the United States:

GREEN TEAS.—*Chinese*: (1). Gunpowder sorts—viz., Shanghai, Ping-suey or pin's-head, Moyune, imperial Moyune, and Canton; (2). Hyson sorts—viz., Shanghai, Shanghai young, Moyune, Moyune young, Canton young, and Twankay or imperial Hyson. *Japanese*: Gunpowder and young Hyson. *Java*: Gunpowder.

BLACK TEAS.—*Chinese*: (1). Congo sorts—viz., Canton, Foo-chow-foo, Hung-muey, Oopack, Kaison, and Oonam; (2) Pekoe sorts—viz., plain orange, Foo-chow, scented orange, Canton scented orange, and flowery Pekoe, Oolong, and Souchong. *Assam*: Congo, orange Pekoe, and Souchong. *Java*: Congo and imperial. The latter is made up into little balls about the size of a pea, and is rare.

The use of the infusion of the leaves of tea as a beverage is general in the s.e. parts of Asia, and has become prevalent also amongst the British—at home and in all their colonies—the Americans, and the Dutch. In Scandinavia, tea is also much used by all who can afford it. In other parts of Europe the use of tea is much less general, and is chiefly confined to maritime districts, towns, and the wealthy. The importation of tea overland through Russia is inconsiderable, and the sea trade is chiefly to Britain and North America.

The *substitutes* for tea, in countries where it is difficult to obtain it, are of two sorts: those which contain theine, and which consequently have the same stimulating effect; and those which are destitute of that principle, and only resemble the true tea in flavor or smell, or which possess some other stimulating principle. Of the former class are—(1). Maté (q.v.); (2). Guarana (q.v.)—so rich is this material in theine that it has lately been used in this country for obtaining that principle; and it has been introduced into Austria and France as a powerful medicine; (3). Coffee-leaves, which are occasionally prepared as a substitute in the West Indies; they would be more gener-

ally used were it not for the disagreeable smell of the infusion; (4). the kola-nut, the active principle of which was some years ago ascertained to be theine.*

The second class, or those which do not possess that principal, are very numerous; but only a few can be said to be of any importance from being in general use in the countries producing them. These are the Siberian tea—leaves of *saxifraga crassifolia*; the Appalachian tea—leaves of *prinos glabra*; the Labrador tea—leaves of *ledum buri-folium*; the Chilian tea—leaves of *Eugenia ugni*; Trinidad pimento tea—leaves of *Eugenia pimenta*; and the leaves of the partridge-berry, which are used in some parts of North America. The Faham tea of Mauritius, and a great many more, should be regarded in the light of medicines rather than as ordinary beverages, although they are generally classed as substitutes for ordinary tea.

Tea, in its chemical, physiological, and medicinal relations.—On submitting the ordinary commercial tea to analysis, we find that it contains (1) a volatile or essential oil; (2) theine or caffeine, described in this work under the latter name; (3) a nitrogenous compound analogous to caseine or gluten; (4) a modification of tannin; besides gum, sugar, starch, fat, woody fiber, salts, etc. The volatile oil gives to tea its peculiar aroma and flavor. The proportion in which it exists is, according to Miller, about 0.79 per cent in green, and 0.6 per cent in black tea. It may be obtained by distilling the tea with water, and is found to exert a most powerfully stimulating and intoxicating effect. In China tea is seldom used until it is a year old, on account of the well-known intoxicating effects of new tea, due probably to the larger proportion of essential oil which it usually contains. The headache and giddiness of which tea-tasters complain, and the attacks of paralysis to which, after a few years, persons employed in packing tea are found to be liable, are due to the action of this oil, which according to Johnston, "does not exist in the natural leaf, but is produced during the process of drying and roasting." *Chemistry of Common Life*, 1855, vol. i.

The theine or caffeine, an alkaloid of weak basic properties, varies considerably in different kinds of tea. Peligot found it to range from 2.2 to 4.1 per cent in ordinary green teas, while very rarely it amounted to 6 per cent; whereas from the researches of Stenhouse it appears that not more than 2 per cent is usually contained in the ordinary teas in the English market. It may readily be obtained by the following simple experiment. When dry finely-powdered tea leaves, or a dried watery extract of the leaves, are put on a watch-glass covered with a paper cone, and the whole is placed upon a hot plate, or exposed to the heat of a spirit-lamp, a white vapor gradually rises and condenses on the interior of the cone, in the form of small crystals, which consist of theine. As it has no odor, and only a slightly bitter taste, it obviously has little to do with the taste or flavor of the tea from which it is extracted; it is, however, to the presence of this ingredient that the peculiar physiological action of tea on the animal economy is due. This substance is represented by the formula, $C_8H_{10}N_4O_2 + H_2O$, and is remarkable for the large quantity of nitrogen (28.83 per cent) which it contains, and which is nearly

* Dr. Daniell's observations on the kola-nut (see the article COLA-NUT) are of such importance as to demand a notice here. From time immemorial the seeds of the kola-nut have been held in inestimable value as a luxury by the inhabitants of the vast tract between the west coast and the region of Central Africa known as Sudan; and the trade in these nuts has extended to various markets on the Mediterranean. The Portuguese, Dutch, and subsequently the English voyagers, fell into the negro predilections for this fruit; and eventually the due gratification of this want became a matter of imperative necessity. Dr. Daniell's knowledge of the tonic and astringent properties of these nuts was gained during his residence on the Gold Coast, where the white inhabitants were in the habit of taking a decoction of the fresh nuts, with apparent benefit, in a particular form of endemic diarrhoea, arising more from local relaxation of the mucous membranes than from constitutional debility. On taking the medicine late, two evenings in succession, when he was afterward suffering from an attack of this kind in Jamaica, he found that he was deprived of sleep during the remainder of the night. On intermitting the decoction, the natural rest returned, and on returning to it, the insomnia again occurred. Hence he was led to suspect that a substance analogous to theine must be present; and a chemical analysis of the nuts yielded crystals in all respects resembling those of theine, and subsequently proved by the more careful investigations of Dr. Atfield to be composed of that alkaloid. Wherever the slave-trade prevailed, the tree yielding the kola-nut (*cola acuminata* of Robert Brown) followed as a matter of necessity, being imported and cultivated for the benefit of the negro. It was thus introduced into the Mauritius, Jamaica, and other West India islands, Brazil, Mexico, etc. It was specially intended to act in warding off the predisposition to epidemic outbreaks of suicidal mania, which not unfrequently almost depopulated considerable districts. While Dr. Daniell's experiments disprove the statement (alluded to in the article COLA-NUT) that these seeds render bad water palatable, his investigations, confirmed as they are by Dr. Atfield's chemical analysis, show, that whatever may be their food-value (which Dr. Daniell estimates higher, from his observations, than Dr. Atfield from their analysis), they may be advantageously substituted for coffee. See the papers by Dr. Daniell, "On the Kola-nut of Tropical West Africa," and by Dr. Atfield, "On the Food-value of the Kola-nut," in the *Pharmaceutical Journal* for March, 1865.

†The following comparative analysis of tea, coffee, and the dry kola-nut are interesting, as showing how nearly they contain the same organic constituents, although in different proportions:

| 100 Parts of tea contain | 100 Parts of Coffee contain | 100 Parts of Kola- nuts contain |
|-----------------------------|--------------------------------|------------------------------------|
| Water..... .5 | 12 | 13.65 |
| Theine..... .3 | 1.75 | 2.13 |
| Caseine.....15 | 13 | 6.33 |
| Gum.....18 | 9 } | |
| Sugar..... 3 | 6.5 } | 10.67 |
| Starch..... a trace | a trace | 42.00 |
| Tannin.....26.25 | 4 | .. |
| Aromatic oil.....0.75 | 0.002 } | |
| Fat..... 4 | 12 } | 1.52 |
| Fiber.....20 | 35 | 20.00 |
| Mineral substances..... 5 | 6.7 | 3.20 |

double the amount contained in albumen, fibrine, etc. It is also remarkable as occurring in plants very unlike each other, and growing in remote countries, which have by instinct been selected by different nations for the purpose of yielding a slightly exciting and very refreshing beverage (see above). From numerous experiments, it appears that the introduction into the stomach of a small quantity of theine (such as three or four grains, which is the quantity contained in about one-third of an ounce of good tea) has the remarkable effect of diminishing the daily waste or disintegration of the bodily tissues, which may be measured by the amount of solid constituents contained in the urinary secretion. And if the waste be lessened, the necessity for food to repair that waste will obviously be diminished in an equal proportion. "In other words," says Professor Johnston, "by the consumption of a certain quantity of tea, the health and strength of the body will be maintained in an equal degree upon a smaller supply of ordinary food. Tea, therefore, saves food—stands to a certain extent in the place of food—while at the same time it soothes the body, and enlivens the mind."—*Op. cit.* p. 173. It should, however, be stated, that the generally accepted view, that theine checks the destruction of the tissues, has been recently called in question by an excellent experimental observer, Dr. Edward Smith, in various memoirs published in the *Philosophical Transactions* and elsewhere. If double the above quantity of theine (or of the tea containing it) be taken, there is a general excitement of the circulation, the heart beating more strongly, and the pulse becoming more rapid; tremblings also come on, and there is a constant desire to relieve the bladder. At the same time the imagination is excited, the mind begins to wander, visions appear, and a peculiar kind of intoxication comes on; the symptoms finally terminating, after a prolonged vigil in a sleep arising from exhaustion. It is not definitely known what changes theine undergoes in the animal economy, but when oxidized artificially it becomes decomposed into methylamine or methyllia, $\text{CH}_3 \cdot \text{NH}_2$, hydrocyanic acid, HCN, and amalic acid, $\text{C}_{12}\text{H}_{12}\text{N}_4\text{O}_7$. The nitrogenous compound allied to caseine or gluten constitutes about 15 per cent. of the weight of the leaf. As hot water extracts very little of this substance, a large quantity of this nutritious matter, which forms about 28 per cent. of the dried spent leaves, is thrown away. Much of it might be dissolved if a little carbonate of soda were added to the boiling water with which the tea is made; and in the brick-tea (the refuse and decayed leaves and twigs, pressed into molds) used by the Tartars, most of this substance is utilized. They reduce the tea to powder, and boil it with the alkaline water of the steppes to which salt and fat have been added, and of this decoction they drink from 20 to 40 cups a day, mixing it first with milk, butter, and a little roasted meal. But without the meal, mixed only with a little milk, they can subsist for weeks on this thin fluid food. To the *astringent principle* or *tannin*, which forms from 13 to 18 per cent of the dried leaf, tea owes its astringent taste, its constipating effect upon the bowels, and its property of communicating an ink-like color to water containing salts of iron. Whether this ingredient contributes in any degree to the exhilarating, satisfying, or narcotic action of tea, is not known. Professor Johnston thinks it probable that it does exert an exhilarating effect, from the fact, that a species of tannin is the principal ingredient of the Indian betel-nut, which, when chewed, produces a mild and agreeable form of intoxication.

It is usual to judge of the quality of a tea by its aroma, and by the flavor and color of the infusion which it yields; but to these tests should be added the determination of the amount of soluble matter which it readily yields to boiling water. It is stated by Miller that our ordinary tea contains about 45 per cent of soluble matter; but the independent researches of Davy and Peligot show that boiling water seldom extracts more than one-third of the weight of the dry tea; while in J. Lehmann's experiments, only one-sixth (15.5 per cent) was extracted. Good tea should, moreover, not yield more than 5 or 6 per cent of ash when incinerated; and a portion of this is probably due to the coloring matter which the Chinese add to the green teas prepared for the foreign market. For this purpose they used to employ a mixture of Prussian blue and gypsum, but indigo is now commonly used, which is probably harmless. Drinkers of green tea who wish to know which of these adulterations they are swallowing, may easily determine the point by the following simple experiment: "If a portion of the tea be shaken with cold water and thrown upon a bit of thin muslin, the fine coloring matter will pass through the muslin and settle to the bottom of the water. When the water is poured off, the blue matter may be treated with chlorine, or a solution of chloride of lime. If it is bleached, it is indigo; if potash makes it brown, and afterward a few drops of sulphuric acid make it blue again, it is Prussian blue."

Much has been written regarding the dietetic and medical uses of tea. While some physicians have over-praised its value, others have regarded it as the source of numerous diseases, especially of the nervous system. In his admirable work on *Hygiene*, Dr. Parkes remarks that "tea seems to have a decidedly stimulative and restorative action on the nervous system, which is perhaps aided by the warmth of the infusion. No depression follows this. The pulse is a little quickened. The amount of pulmonary carbonic acid is, according to Dr. E. Smith, increased. The action of the skin is increased; that of the bowels lessened. The kidney excretion is little affected; perhaps the urea is a little lessened, but this is uncertain, the evidence with regard to the urine being very contradictory." Dr. E. Smith considers that "tea promotes all vital actions." Dr. Parkes regards it as a most useful article of diet for soldiers, and it is well known that cold tea is frequently preferred to beer or cider by sportsmen, reapers, and others

engaged in laborious work in hot weather. As a general rule, tea is very prejudicial to young children, and is not a suitable drink till growth is completed; and adults of an irritable constitution, or a leuco-phlegmatic temperament, often suffer from its use. Those with whom tea does not agree will generally find cocoa the best substitute. Old and infirm persons usually derive more benefit and personal comfort from tea than from any other corresponding beverage. In fevers, tea, in the form of a cold weak infusion, is often of great service. In persons of a gouty and rheumatic tendency, and especially in such as are of the *lithic acid diathesis* (q.v.), weak tea, taken without sugar, and with very little milk, is the best form of ordinary drink. In some forms of diseased heart, tea proves a useful sedative, while in other cases it is positively injurious; and a cup of strong green tea, especially if taken without sugar or milk, will often remove a severe nervous headache. It is nearly as powerful an antidote in cases of opium-poisoning as coffee; and very strong tea has been the means of preserving life, in cases of poisoning by tartar-emetic, the tannin being in these cases the active agent. It is impossible to speak too strongly against the habit occasionally adopted by students of keeping off their natural sleep by the frequent use of strong tea. The persistent adoption of such a habit is certain to lead to the utter destruction of both bodily and mental vigor.

The American tea trade began in the year 1784, when the first American ship sailed for China. This enterprise was followed in the next year by the dispatching of two vessels, resulting in an importation, direct, of 880,000 lbs.; and in 1786 five vessels brought more than a million pounds. The first direct importation of Japan tea was made in 1868 from Yokohama to San Francisco. The intervention of steam in the tea-carrying trade occurred first in 1867, when the Pacific mail steamer *Colorado* made a voyage to Hong Kong and Yokohama, and brought back tea to San Francisco. The time now occupied in the transportation of tea from Japan to New York is 30 to 40 days; and from Shanghai to the same port, 40 to 50 days, via San Francisco and the Pacific railroad. During the war of the secession there was levied a war-duty of 25 cents per lb. on tea; which was reduced to 15 cents in 1871, and entirely removed in the following year. The value of the tea imported into the United States in 1860 was \$8,915,327; in 1870, \$13,863,273; in 1880, \$19,782,631; in 1890, \$12,317,493.

TEACHERS COLLEGE, in New York City, a professional school for the training of teachers and the study of education. Students may become candidates for degrees in Columbia university, with which it is affiliated. Courses in manual training are offered in the Horace Mann school, a department of the college. In 1897 the faculty numbered 62, and the students 850.

TEACHING OF THE TWELVE APOSTLES, a ms. almost universally held by scholars to be of very early date, and the handiwork of an unknown follower of the first disciples of Christ. This ms. was found by Philotheos Bryennios (q.v.), Metropolitan of Nicomedia, in the library of the monastery of the Most Holy Sepulcher, Constantinople, 1873. Its discovery caused a profound sensation in the Christian world, even surpassing that which followed the publication, in 1875 (also by Bryennios), of the two Epistles of Clement, from an original ms. found in the same place. It has for its sub-title: "Teaching of the Lord through the Twelve Apostles to the Nations," and treats, in a simple and dignified manner, of certain moral laws and the observance of certain customs. Thus, the first chapters are occupied with a partial repetition of the Sermon on the Mount and of portions of the gospels. The seventh chapter enjoins baptism in the name of the Trinity, and in "living" water; but if that be "not convenient," then in other; and if cold water be not convenient, then in warm. The baptizer and the baptized are urged to fast before the baptism, the latter for one or two days. The fasting (chap. viii.) is to be on the "fourth" and on the "preparation" day, not the "second" and "fifth," like that of the "hypocrites." The Lord's prayer is to be used three times a day. Concerning the Eucharist (ix.) certain prayers are commanded, and a warning added not to admit the unbaptized to its participation. In the xvth chap., confession is urged before the "sacrifice" of the Lord's day; but whether the word here used (*a ἡραρε legomenon*) προσεξομολέω, indicates the usage of penance at the early date attributed to this ms., remains a matter of controversy. In the xvth chap., mention is made of the character of those called to be "bishops" and "deacons;" the word "priest" does not occur; "prophets," who are frequently referred to, seem to have held high rank as teachers, but possessing less important functions than the "bishops."

The consensus of scholarship is in favor of the authenticity of the Teachings. Against it is urged the saying of Eusebius: "The Teachings of the Apostles are spurious" (though it can scarcely be proved that he meant by this to assert more than that this treatise was not written by an apostle, as its name would imply); further, the baptismal customs and the Eucharistic prayer indicated differ from the known customs of the Eastern church at that time; it bears the intrinsic marks of a narrow but pious sectarianism; lastly, it is unlikely that such an exposed place as the library where this ms. was found should escape so completely the successive ravages of conquerors. These objections are more than met by the following considerations: The *Apostolical Constitutions*, VII., written before the close of the fifth century, follows it closely; Barnabas quotes from the xviii chap.; Athanasius and others refer to it; most important of all, Clement of Alexandria, in many places, uses its very language. Eusebius mentions the Teachings as among the very ancient books which occupy a place next to the canonical scriptures, classifying it with the *Acts of Paul*, *The Shepherd*, *The Revelation of Peter*, and *The Epistle of Barnabas*. Athanasius

mentions it as one of the books appointed to be read in the churches. Again, abundant proofs are brought forward to show that the Teaching antedates Barnabas, and that, therefore, the quotations referred to above are from the former and not the latter; the same holds good with the *Apostolical Canons* and *Apostolic Constitutions*. Indeed, nearly all evidences, external and internal, point to the authenticity of this treatise. However, even its strongest upholders claim for it nothing more than that it is a valuable testimony as to certain doctrines and usages of the church in a certain region, during the closing years of the apostolic age; it is in nowise set forth as of any authority. As to its date, while some place it as early as the year 70, and some as late as 165, the tendency of critical scholarship is toward the earlier date, and the period from 90 to 100 is favored by many critics.

TEAK, the name of two kinds of timber, valuable for ship-building and other purposes, one of which is known as **INDIAN TEAK**, and the other as **AFRICAN TEAK**. The trees which produce them belong to very different orders. **INDIAN TEAK** (*tectona grandis*) is a tree of the natural order *verbenaceæ*. It is found in the mountainous parts of Malabar, and elsewhere in Hindustan, and in the Eastern Peninsula, Ceylon, Java, etc. It has been introduced in some parts of India, in which it is not indigenous. Dr. Roxburgh introduced it in the low grounds of the Circars as early as 1790. It has been planted in some parts of Ceylon, but not yet with much result, as it takes 60 or 80 years to grow to a large size. It is a beautiful tree, attaining a height sometimes even of 200 ft., and rising above all the other trees of the East Indian forests. It has deciduous oval leaves of 12-24 in. long, covered with rough points; great panicles of white flowers, with 5-6 cleft corolla, and 4-celled drupes about the size of a hazel-nut. Its flowers are used medicinally in cases of retention of urine, and its leaves by the Malays in cholera. Silk and cotton stuffs are dyed purple by the leaves. The timber is the most valuable produced in the East Indies; it is light and easily worked, strong, durable, and not liable to the attacks of insects. It abounds in silex, and resembles coarse mahogany. It is extensively used for ship-building, for which purpose it is imported into Britain. All the finest ships built in India, and many built in England, are of teak. The most extensive teak forests are in Pegu. The teak generally rather grows in clumps in forests than forms forests of itself.—**AFRICAN TEAK**, sometimes called **AFRICAN OAK**, is a timber similar to East Indian teak. It is now believed to be the produce of *Oldfieldia Africana* a tree of the natural order *Euphorbiaceæ*; but the leaves of many different trees have been brought to botanists as those of the African teak.

TEAL, *Querquedula*, a genus of ducks (*anatidæ*) with very slightly lobed hind-toe, narrow bill, as long as the head, the sides nearly parallel, or widening a little at the end, the wings pointed, the tail moderately large, and wedge-shaped. Some naturalists divide the genus into two—*nettion*, in which the bill has parallel sides, and a small nail at the tip; and *querquedula*, in which it is widened, and has a larger nail. The species are numerous, the smallest of the ducks, and widely distributed over the world. They generally frequent rivers and lakes, feeding principally at night on aquatic insects, worms, mollusks, seeds, etc. The **COMMON TEAL** (*Q. or N. crecca*) is plentiful in Britain and in most parts of Europe. It is occasionally but rarely seen in North America. Its whole length is about 14 inches. It is a very beautiful bird; the head of the male brownish-red, the body transversely undulated with dusky lines, a white line above, and another beneath the eye, the speculum black and green. It makes its nest on the margins of lakes or rivers, of decayed vegetable matter lined with down, and lays eight or ten eggs. Its flesh is extremely delicate. It was domesticated by the ancient Romans, and seems capable of being advantageously introduced into our poultry yards.—The **GARGANEY** is another British species.—The **GREEN-WINGED TEAL** (*Q. or N. Carolinensis*) of North America is very similar to the common teal, but it is at once distinguished by a white crescent in front of the bend of the wings. It is occasionally seen in Europe. In its summer migrations, it visits very northern regions.—The **BLUE-WINGED TEAL** (*Q. discors*) is very abundant in many parts of North America. It is rather larger than the common teal. It is easily domesticated.

TEAR PITS. See **DEER**.

TEARS. See **LACHRYMAL ORGANS**.

TEASEL, *Dipsacus*, a genus of plants of the natural order *Dipsacæ* or *Dipsacaceæ*. This order consists of herbaceous and half-shrubby exogenous plants, with opposite or whorled leaves, and flowers in heads or whorls, surrounded by a many-leaved involucre. About 150 species are known, natives of the temperate parts of the Old World. In the genus *Dipsacus*, the flowers are separated from each other by long, stiff, prickly-pointed bracts. The only valuable species of the order is the **FULLER'S TEASEL**, or **CLOTHIER'S TEASEL** (*D. fullonum*), a native of the s. of Europe, naturalized in some parts of England. It is a biennial, several feet high, with sessile serrated leaves, the stem and leaves prickly; and with cylindrical heads of pale or white flowers, between which are oblong, acuminate, rigid bracts, hooked at the point. The heads are cut off when the plant is in flower, and are used in woolen factories, and by fullers and stockingmakers, for raising the nap on cloth. No mechanical contrivance has yet been found to equal teasel for this purpose; to which the hooked points, the rigidity, and the elasticity of the bracts are admirably adapted. The heads of teasel are fixed on the circumference of a wheel or cylinder, which is made to revolve against the surface of the cloth.

TECHE, BAYOU, in Louisiana, begins in Rapides parish, and after a s.e. course of about 175 m. empties into Atchafalaya bayou. It is navigable for small steamboats as far as St. Martinsville.

TECHNICAL EDUCATION (Gr. *techné*, art) means special instruction and training for the industrial arts. This subject has received much attention of late years in consequence of comparisons drawn between the manufactures of the United States and those of other countries shown in the great international exhibitions held in London, Paris, Vienna, and Philadelphia. Some good judges had asserted that, owing to the superior training given in continental schools to young persons in the sciences specially bearing on the arts and manufactures, other countries were making more rapid progress than our own. Whatever the state of things in 1876, it is certain that since that date marked progress has been made. The main centre of the machinery of the science and art department of Great Britain is at South Kensington. The appropriation for this department in 1890 was £474,896. In 1881, 850,000 persons received elementary art instruction; the number of provincial and elementary art schools being 32,000. Among the colleges subsidized by the department are Owens college, Manchester, Sir Josiah Mason's college, Birmingham, and Firth college, Sheffield. The government school of mines and Metropolitan school of science applied to mining and the arts was reorganized in 1881 as the Normal school of science and Royal school of mines. Its primary purpose is the instruction of teachers and of students of the industrial classes selected by competition in the science schools of the United Kingdom. Through the exhibitions attached to the yearly examinations of the science and art department, this institution places a training in science within the reach of promising students in all parts of the country, though this is exclusively theoretical. In 1878, was provisionally constituted "The City and Guilds of London institute for the advancement of technical education." Twenty-two of the Livery companies, including 9 out of the 12 great guilds, are represented on the council of the institute, and jointly contribute £21,000 annually to its funds. At first the association limited its functions to subsidizing technical education in schools and colleges in London; University and Kings, in particular, receiving grants toward the support of professorships of technical science and art. But it now has schools of its own, and has assisted those of many towns throughout the kingdom. At Kensington it has established a South London technical art school, where instruction is given in modeling, design, wood-engraving, and china-painting. In 1881, it laid the foundation of Finsbury college, in Tabernacle Row, designed to be a finishing school for those entering industrial life at a comparatively early age, a supplemental school for those already engaged in the factory or workshop, and a school preparatory to the central institution. Its departments are: mathematical and mechanical; physical; chemical; applied art. Over each department is a professor, assisted by demonstrators. There are in addition, lecturers and teachers in special subjects, and skilled artisans in the work-shops. Local technical schools have arisen in many of the smaller cities—as Manchester, Sheffield, Nottingham, etc. The head guardians of technical education laid in 1881, at South Kensington, the corner-stone of a great central institute, estimated to cost £75,000, and furnished with laboratories on the most complete scale, lecture-theaters and class-rooms. It is designed to supply a professional training to sons of manufacturers hitherto compelled to study abroad, as a finishing school for artisans trained in branch or provincial colleges, and to train a competent body of teachers. The certificates awarded by the institute on examination, are diplomas of both theoretical and practical efficiency in the subjects for which they are given. Candidates for the institute's full technological certificate must have passed the society and art department's examinations in two specified subjects in the elementary stage, and for the institute's full technological certificate with honors (required of technical teachers), two specified subjects in the advanced stage. The results of this popular education, directly and indirectly, are patent and gratifying. No Nottingham manufacturer need any longer seek a designer on the continent, but can hold his own aggressively against any lace-manufacturer in the world. At the Paris exhibition of 1878, the French saw themselves outstripped by the English in the production of some art manufactures. The European continental countries have long been making great exertions in the cause of technical education. In Paris, free instruction in art is offered to all workmen employed in certain trades. In 1881, the municipality of Paris spent £32,000 for this purpose; in 1882, still more—altogether, double the amount for its 1,900,000 inhabitants which London spent on its 4,000,000. The technical school of the École centrale, in Paris, has a new building, the cost of which was nearly £240,000. Throughout France, art and technical schools are supported by the government and the several municipalities. At Liege, Belgium, 6,000 young men are engaged nightly in the art and science schools. Switzerland and Germany are equally active, and in India there are art schools having as an object the improvement of native industries. The School of Mines at Columbia College (q.v.), New York, the Sheffield Scientific School at Yale University (q.v.), New Haven, the Stevens Institute (q.v.) at Hoboken, the Rensselaer Polytechnic Institute (q.v.), Troy, the Rose Polytechnic Institute, Terre Haute, and the Case School of Applied Science at Cleveland, are among our leading scientific schools, and from them come largely our civil and mining engineers, chemists, geologists, electricians, inventors, etc. In considering technical education as directly applied to manufactures, we must exclude these, and also a large number of art schools and associations which have not as their leading object the training of

workmen for the industrial arts. The Massachusetts Institute of Technology at Boston includes a school of mechanic arts, with a workshop conducted on the plan of the Imperial Technical school at Moscow, and the Lowell School of Practical Design, in which instruction is given in designing patterns for laces, paper hangings, and textile fabrics. The number of students in both departments in 1883 was 112. The Worcester co. Free Institute of industrial science at Worcester (incorporated 1865), has similar courses. In New York City there is a free scientific course at the Cooper Union, and in its art schools for women nearly 2,000 students yearly are prepared for industrial work. The women's institute of technical design (established 1881) has a much smaller number of pupils, but gives thorough instruction in its departments. The general society of mechanics and tradesmen, organized 1785, for the improvement of mechanics, is now a free drawing school, aiming to make mechanics more proficient, and to train designers for art industries. It admits both sexes, has a good technical reference library, gives courses of lectures every winter, and is in a prosperous condition. The New York trade school instructs mechanics in brick-laying, sanitary engineering, house and decorative painting, fresco-painting, and the art of mixing colors, and in polishing and repairing hard wood. Fifty-two young men were instructed in 1881-82. The workingmen's school, established by the society for ethical culture, combines industrial training with common school studies. The technical schools of the Metropolitan museum of art (organized about 1881) aim to furnish facilities not hitherto attainable in this country to artists and artisans, and to give thorough technical instruction in designing, decoration, modeling, carving, carriage drafting and construction, etc., and to furnish an acquaintance with the theory and practice of the arts. There is an endowment fund of \$50,000, and the carriage-builders' association contributes \$1,200 yearly to the department under its special supervision. There are at present accommodations for about 900; and about 100 students yearly attend the classes. In Philadelphia, greater interest has been awakened. The drawing school of the Franklin Institute for the promotion of the mechanic arts was established some fifty years ago, teaches "such drawing as will be useful in the workshop, and applicable to construction as well as to ornamentation," and instructs the student "to use properly his hands and his instruments." Its classes are always full. The Philadelphia School of Design for women (founded 1847) has for its object the instruction of women in decorative art, and the various practical applications thereof to industrial pursuits. It receives an annual appropriation from the state. The Spring Garden institute art school fits the pupils at any stage of the instruction to do useful work in the mechanic arts, or, if they complete the course, to become draughtsmen, architects, designers, artists, or teachers of drawing. The public school of industrial art (organized 1881, by and now under the direction of Mr. Charles G. Leland), receives its pupils (12-16 years of age) from the public grammar schools; and among the branches taught are wood-carving, modeling in clay with color and glaze, carpenter's work, cabinet-making, mosaic work and marquetry. The practical results have been most gratifying. The Ohio mechanics' institute, Cincinnati, organized 1828, for the instruction of apprentices in mechanical, architectural and artistic drawing, has recently become a school of technology. It reported in 1882, 280 pupils (males). The Cincinnati museum association incorporated 1881, has erected a fine building at a cost of \$50,000, on land given by the city, has endowment funds of over \$460,000, and, forming its museum on the plan of that at South Kensington, promises, through its schools of science and art, to work important changes in the quality of the goods and articles manufactured in the state. The Maryland Institute for the promotion of the mechanic arts at Baltimore (organized 1848), aims particularly to furnish the most thorough instruction in the various branches of art to persons wishing to become professional designers, decorators or skilled artisans. Number of pupils in the day school, 1883, 177; in the night school, 497. Illinois Industrial University at Urbana, offers a two years' course in industrial art, and a more advanced course for those wishing to become teachers or designers. Although mechanical drawing is taught in the schools of many of our larger cities, no systematic attempt has been made, unless it is in Massachusetts, to furnish this instruction with a view to future profit to the commonwealth; and in Massachusetts alone, is there a state normal art school (established 1873), for the training of teachers and masters for the industrial drawing schools of the state. See MANUAL TRAINING.

TECHNIQUE (German, *Technik*), a French term which signifies the mechanical part of instrumental playing.

TECHNOLOGY (Gr. *techné*, art) is the name given to the science or systematic knowledge of the industrial arts. In its widest sense, it would embrace the whole field of industry, but it is restricted in usage to the more important manufactures (spinning, weaving, metallurgy, brewing, etc.). Technology is not an independent science, having a set of doctrines of its own, but consists of applications of the principles established in the various physical sciences (chemistry, mechanics, mineralogy, etc.) to manufacturing processes. A complete course of instruction in technology could only be of the most superficial kind. The essential preparation for any branch of the manufacturing arts is the study of the fundamental physical sciences which are taught in schools and universities; and the special applications to the branch which the student has to pursue professionally can best be learned from special treatises on the subject in connection with practice in a manufacturing establishment. See TECHNICAL EDUCATION.

TECK, a duchy situated in Swabia during the middle ages. It derived its name from the castle of Teck, the ruins of which are still in existence. The house of Hapsburg gained possession of it in the 11th c., and sold it in the 14th c. to the dukes of Würtemberg.

TECK (PRINCE AND DUKE OF), FRANCIS PAUL CHARLES LOUIS ALEXANDER, Count of Hohenstein, only son of Duke Alexander of Würtemberg and the Countess Hohenstein, was born Aug. 27, 1837. As the marriage of his mother to Duke Alexander was only recognized as morganatic by the German law, he bore the title of Count of Hohenstein until a decree of the King of Würtemberg in 1863 conferred on him the title of Prince Teck. He served in the Austrian army, but resigned his commission in 1860. He married Princess Mary Adelaide of Cambridge, June 12, 1866. She died 1897.

TECUMSEH, or **TECUMTHA**, about 1768-1813; chief of the tribe of Shawnees; b. near the site of Springfield, Ohio. With his brother, Elskwatawa, who claimed the gift of prophecy, he attempted to form an alliance of all the western tribes against the whites. A village of about 400 warriors was gathered at Greenville, and they were ordered to remove by Gen. Harrison, who was then governor of the territory of Indiana. Various hostile movements on the part of Tecumseh's forces led to the battle of Tippecanoe, Nov. 7, 1811. Harrison was at the head of about 800 men, and was attacked by Tecumseh in his own camp. The whites repulsed and defeated the Indians. Before a treaty had been concluded with the tribes, the war of 1812 broke out and Tecumseh allied himself to the British forces. He took part in the battles on the Raisin river and at Maguaga; was wounded in the latter, and made brig.gen. in the British forces for his services. At Fort Meigs he showed humanity in his treatment of prisoners. The field of battle at the Thames was selected by Proctor and Tecumseh, the latter commanding the right wing. He was killed while fighting desperately. A life of the great Indian chief was written, 1841, by Benjamin Drake.

TE DEUM (*Te Deum laudamus, Te Dominum confitemur*), a well-known hymn (so called from its first words) of the Roman Catholic church, sung on all occasions of triumph and thanksgiving, and a theme upon which the most celebrated composers have from time immemorial exercised their musical genius. The hymn is one of the most simple, and at the same time the most solemn and majestic, in the whole range of the hymnology of the Roman Catholic church. Its authorship is uncertain. An ancient chronicle (long posterior, however, to the supposed date of the composition of this hymn, and otherwise destitute of authority) describes the *Te Deum* as the joint production of Sts. Ambrose and Augustine, into which they both burst forth by a common inspiration on occasion of the baptism of Augustine. From this supposed origin, the *Te Deum* is commonly called the Ambrosian hymn. It is ascribed by other authorities to Hilary of Poitiers, but is most probably considerably later. Besides its general use on occasions of joyous celebrations, the *Te Deum* forms part of the daily "matins" of the Roman breviary, and is recited at the end of "matins" on all festivals, and on all Sundays except those of Advent and Lent, to which, as being seasons of penance, the *Te Deum* is considered inappropriate. Its use is very ancient. It is universally admired by Protestants as well as Roman Catholics, and exhibits none of the peculiarities of Roman Catholic theology.

TEEL-SEED. See OILS and RAM-TIL.

TEES, a river in the n. of England, is 90 m. long, flows east, forming the boundary between the counties of Durham (q.v.) and York (q.v.), and falls into the North sea, 10 m. below Stockton, to which town it is navigable for vessels of 60 tons burden.

TEETH, **THE**. A tooth is described by Prof. Owen, the highest authority on this subject, as "a hard body attached to the mouth or commencement of the alimentary canal, partially exposed when developed. Calcified teeth are peculiar to the vertebrates, and may be defined as bodies primarily, if not permanently, distinct from the skeleton, consisting of a cellular and tubular basis of animal matter containing earthy particles, a fluid, and a vascular pulp."—*The Anatomy of Vertebrates*, 1866, vol. i. p. 359. "They present," says the same writer, "many varieties as to number, size, form, structure, position, and mode of attachment, but are principally adapted for seizing, tearing, dividing, pounding, or grinding the food.* In some species they are modified to serve as formidable weapons of offense and defense; in others, as aids in locomotion, means of anchorage, instruments for uprooting or cutting down trees, or for transport and working of building materials. They are characteristic of age and sex; and in man they have secondary relations, subservient to beauty and to speech. Teeth are always intimately related to the food and habits of the animal, and are therefore highly interesting to the physiologist; they form, for the same reason, important guides to the naturalist in the classification of animals."—*Circle of the Sciences; Organic Nature*, vol. i. p. 264.

True teeth consist of one, two, or more tissues, differing in their chemical composition and in their microscopical appearances. "Dentine," which forms the body of the tooth, and "cement," which forms its outer crust, are always present; the third tissue, the "enamel," when present, being situated between the dentine and cement. The *Sentine*, which is divided by Prof. Owen into hard or true dentine, vaso-dentine, and

* Hence the division of the teeth into incisors, or cutting teeth; molars, or grinding teeth; etc.

osteo-dentine, consists, according to that physiologist, of an organized animal basis, disposed in the form of extremely minute tubes and cells, and of earthy particles; these earthy or calcareous particles being either blended with the animal matter of the interspaces and walls of the tubes and cells, or contained in a minutely divided state in their cavities. The tubes and cells contain, besides the calcareous particles, a colorless fluid, which is probably transuded blood plasma, or *liquor sanguinis*, and contributes to the nutrition of the dentine. In hard or true dentine, the *dental tubes* proceed from the hollow of the tooth known as the *pulp cavity*, in a slightly wavy course, nearly at right angles to the outer surface. "The hard substance of the tooth is thus arranged in hollow columns, perpendicular to the plane of pressure, and a certain elasticity results from these curves; they are upright where the grinding surface of the crown receives the appulse of the opposing tooth, and are horizontal where they have to resist the pressure of contiguous teeth. The tubuli, besides fulfilling the mechanical ends above stated, receive the plasma transuded from the remains of vascular pulp, which circulates by anastomosing branches of the tubuli through the dentine, maintaining a sufficient, though languid vitality of the system. The delicate nerve-branches on the pulp's surface, some minute production of which may penetrate the tubuli, convey sensations of impressions affecting the dentine—sensations of which every one has experienced the acuteness, when decay has affected the dentine, or when mechanical or chemical stimuli have "set the tooth on edge;" but true dentine has no canals large enough to admit capillary vessels with the red particles of blood." When a part of the primitive vascular pulp from which the dentine is developed remains permanently uncalcified, red blood is carried by "vascular canals" into the substance of the tissue. Such dentine is called *vaso-dentine*, and is often combined with true dentine in the same tooth, as, for example, in the large incisors of certain rodents, the tusks of the elephant, and the molars of the extinct megatherium. Another modification of the dentine is when the cellular basis is arranged in concentric layers around the vascular canals, and contains "radiated cells," like those of bone; this is termed *esteo-dentine*, and resembles true bone very closely. The *cement* always corresponds in texture with the osseous tissue of the same animal, and wherever it occurs in sufficient thickness, as on the teeth of the horse or ox, it is traversed like bone by vascular canals. Moreover, when the osseous tissue contains minute radiated cells, precisely similar cells are likewise present in the canal, and constitute its most marked characteristic. The relative densities of dentine and cement vary according to the amount of earthy matter. In the complex grinders of the elephant and some other animals, the cement, which forms nearly half the mass of the tooth, wears down sooner than the dentine. The *enamel* is the hardest of all the animal tissues, and contains no less than 96.4 per cent of earthy matter (mainly phosphate of lime), while dentine contains only 72 per cent, and cement and ordinary bone 69 per cent of earthy matter. The earthy matter is contained in comparatively wide canals, composed of animal membrane of extreme tenuity.

In tracing the teeth upward from their simplest to their most complicated forms, we find a very few examples (solely among fishes—as, for example, the wrasse), in which teeth consist of a single tissue—a very hard kind of non-vascular dentine. Teeth consisting of dentine and vaso-dentine are very common in fishes, the hard dentine being external, and performing the office of enamel. Dentine and cement, the latter forming a thick outer layer, constitute the grinding teeth of the dugong. In the teeth of the sloth, the hard dentine is reduced to a thin layer, and the chief bulk of the tooth consists of vaso-dentine internally, and a thick crust of cement externally.

"The human teeth and those of the carnivorous mammals appear at first sight to be composed of dentine and enamel only; but their crowns are originally, and their fangs are always covered by a thin coat of cement. There is also commonly a small central tract of osteo-dentine in old teeth. The teeth called compound or complex in *mammalia* differ as regards their composition from the preceding only by the different proportion and disposition of the constituent tissues. Fig. 1 is a longitudinal section of the incisor of a horse; *d* is the dentine, *e* the enamel, and *c* the cement, a layer of which is reflected into the deep central depression of the crown; *s* indicates the colored mass of tartar and particles of food which fills up the cavity, forming the 'mark' of the horse-dealer."—*Organic Nature*, vol. i. p. 267. Far more complex forms of teeth than this may be produced by peculiar arrangements, chiefly inflections, of the tissues. Certain fishes, and a family of gigantic extinct batrachians, to which Owen has, from this remarkable peculiarity, given the name *labyrinthodons* (q.v.), exhibit this kind of complexity in a remarkable degree. Another kind of complication is produced by an aggregation of many simple teeth into a single mass. These compound teeth are most common in fishes, but are occasionally met with in mammals. The teeth of the Cape ant-eater (*oryzomys*), depicted and described by Owen in *The Circle of the Sciences*, are of this kind, each tooth being composed of a congeries of long and slender prismatic denticles of dentine, which are cemented together. In the ele-

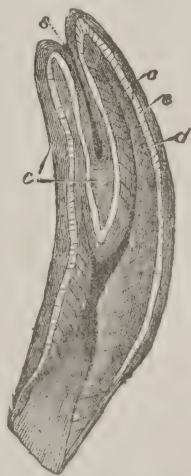


FIG. 1.—Longitudinal section of the incisor of a horse.

phant, the compound molars belong to this class, the denticles being in the form of plates vertical to the grinding surface, and transverse to the long diameter of the tooth. When the tooth is bisected vertically and longitudinally, the three substances, dentine, cement, and enamel, are seen blended together.

Our limited space forbids our entering into any details regarding the teeth of fishes, further than to remark that, in regard to their number, form, substance, structure, situation, or mode of attachment, they offer a greater and more striking series of varieties than do those of any other class of animals. In all fishes, the teeth are shed and are renewed, not once only, as in mammals, but frequently during the whole course of their lives; and, as Prof. Owen observes, "this endless succession and decadence of the teeth, together with the vast numbers in which they often co-exist in the same fish, illustrate the law of vegetation or irrelative repetition, as it manifests itself on the first introduction of new organs in the animal kingdom." While comparatively few fishes are entirely devoid of teeth, we find that in the class of reptiles, the whole order of *chelonina* (tortoises and turtles), the family of toads (*bufonidae* in the order of *batrachia*), and certain extinct genera of *sauria* (lizards) are toothless. Frogs have teeth in the upper, but not in the lower jaw. Newts and salamanders have teeth in both jaws and upon the palate; and teeth are found on the palate as well as on the jaws of most serpents. In most lizards, and in crocodiles, the teeth are confined to the jaws. The teeth in reptiles are for the most part simple, of a conical form, and adapted, as in the case of most fishes, for seizing and holding, but not for dividing or masticating the food. In no reptile does the base of the tooth branch into fangs; and, as a general rule, the base of the tooth is ankylosed to the bone which supports it. The completion of a tooth is soon followed by preparation for its removal and succession, the faculty of developing new tooth-germs being apparently unlimited in this class. For further details regarding the teeth of fishes and reptiles, the reader is referred to Prof. Owen's invaluable *Anatomy of the Vertebrates*, 1866, vol. i. pp. 359-409. Birds having no teeth, we proceed to the consideration of the dental system of mammals—a class which includes a few genera and species that are devoid of teeth. The true ant-eaters (*myrmecophaga*), the pangolins or scaly ant-eaters (*manis*), and the spiny monotrematous ant-eater (*echidna*), are strictly toothless. The ornithorhynchus has horny teeth, and the whales (*balena* and *balænoptera*) have transitory teeth, succeeded in the upper jaw by whale-bone. The female narwhal exhibits nothing more than the germs of two teeth in the substance of the upper jaw; in the male, one of these germs becomes developed into the remarkable weapon which specially characterizes the animal, and to which its generic term *monodon* (single tooth), is due. In the great bottle-nose whale, in the adult state, there are only two teeth (here occurring in the lower jaw); whence the name *hyperoödon bidens*. The elephant has never more than one entire molar, or parts of two, in use on each side of the upper and lower jaws; to which are added two tusks, which are modified incisors, more or less developed, in the upper jaw. Some rodents have two grinders on each side of both jaws, which, added to the four cutting-teeth in front, make 12 in all; but the common number of teeth in this order is 20, although hares and rabbits have 28 each. The number of teeth, 32, which characterizes man, the apes of the old world, and the true ruminants, is the average one of the class mammalia; but according to Prof. Owen, "the typical number is 44." "I have been led," he observes, "chiefly by the state of the dentition in most of the early forms of both carnivorous and herbivorous mammalia which flourished during the eocene tertiary periods, to regard three incisors, one canine, and seven succeeding teeth on each side of both jaws, as the type-formula of diphyodont* dentition."—*On the Classification and Geographical Distribution of the Mammalia*, 1859, p. 18. A few of the monophyodonts possess from 80 to 100 teeth. See the article MAMMALIA. The hog, the mole, the gymnure, and the opossum, are among the few existing quadrupeds which retain the typical number and kinds of teeth. The formula expressing the number of the different kinds of teeth—viz., the incisors or cutting-teeth, the canines or dog-teeth, the premolars, and the molars or true grinder, commonly known as the *dental formula*, is described in the article DENTITION, in which the *milk* or *deciduous* teeth, and the order in which they appear, are also described. It is only in the mammals that we have a well-marked division of the teeth into the four kinds of incisors, canines, premolars and molars, each of which claims a brief description.

The *incisors*, or cutting-teeth, are situated in front, and possess a single conical root or fang, and a vertical crown beveled behind, so as to terminate in a sharp cutting edge. These teeth are specially fitted, as their name implies, for cutting the food. In man, there are two of these incisors in each side of each jaw. In herbivorous animals, they crop the herbage; in rodents (the rabbit, hare, rat, beaver, etc.), these teeth are very much developed, and differ from any other teeth occurring in mammals in this respect, that their growth continues throughout life; and if their length does not con-

* Professor Owen divides the class mammalia, in regard to the times of formation and the succession of their teeth, into the *monophyodonts* (Gr. *mōno*, once; *phý*, generate; and *odont*, tooth), or those that generate a single set of teeth, as the sperm whales, dolphins, porpoises, armadillos, and sloths; and the *diphyodonts* (derived from *di*, twice, etc.), or those that generate two sets of teeth, as the mammals generally, with the above exceptions.

stantly increase, it is because their free extremity or edge is worn down by trituration as fast as they grow at the base from their roots.

The *canines* (so called from their prominence in the dog) come next to the incisors. Their crown is rather conical than wedge-shaped, and their fang sinks more deeply into the jaw than in the case of the incisors. In all carnivorous animals, they are largely developed, being obviously formed for tearing the flesh of their prey. In man, there is one canine tooth in each half-jaw; and there is never more than this number in any of the lower animals.

The *premolars* (known also as bicuspid and false molars) come next in order to the canines; they are smaller than the latter, and their crown presents two pyramidal eminences. In man, there are two premolars in each half-jaw. Their function more nearly approaches to that of the true molars behind them, than to that of the canines.

The *true molars* (or multicuspid) are placed most posteriorly. They are remarkable for their comparatively great size, the square form of the upper surface, on which are from three to five elevations or cusps, and for their short root, which is divided into from two to five branches, each of which is perforated at its extremity. In man there are three molars in each half-jaw, the posterior one being termed the wisdom-tooth from its being cut the latest; they are especially employed for grinding the food, under the action of the muscles of the lower jaw.

The teeth are so admirably adapted for the special purposes which they are called upon to fulfill, that it is generally easy, from a careful examination of them, to say to what class of animals they belong, and to draw various conclusions regarding the habits and structure of the class generally. Thus, in carnivorous animals, the molars are not grinding teeth, but present sharp cutting edges, and those of the upper and lower jaw overlap each other; resembling a pair of scissors in their action. In insectivorous animals, the molars have a tuberculated surface, with conical points and depressions, so arranged as to look into each other. In frugivorous animals, living on soft fruits, these teeth are provided with rounded tubercles, while in herbivorous animals, they have a broad, rough surface, resembling a millstone.

There is also a close connection between the articulation or joint of the lower jaw and the nature of the food used by the animal. Thus, in purely carnivorous animals, in which the teeth simply tear and cut the food, no grinding motion is required, and the jaw is capable only of a simple hinge-motion in the vertical plane; while in herbivorous animals, the joint is so constructed as to allow of extensive sliding and lateral motion of the lower molar teeth upon the upper. In man, both the form of this articulation and the general character of the teeth point to an intermediate position in relation to food, and form a good physiological argument for the mixed diet which general custom has decided to be most favorable and natural to our species.—For further information on this subject, the reader is referred, not only to the three works of the professor from which quotations have been made in this article, but to his splendid *Odontography* (1844), and to his article "Teeth," in *The Cyclopædia of Anatomy and Physiology*; to F. Cuvier, *Sur les Dents*, etc., and to De Blainville's *Osteographie*.

DISEASES OF THE TEETH.—The dangers to which infants and children are exposed during the process of teething, are noticed in the article DENTITION; and we shall therefore here confine our remarks to the affections of permanent teeth, of which the following are the most important:

1. *Caries of the teeth*, usually commences in the dentine immediately below the enamel, a yellow or brown spot being observed on the surface of the tooth over the affected part. The tissue soon becomes softened, and a small cavity is formed, which, after a time, presents an external opening, in consequence of the unsupported enamel giving way. The substance of the tooth now decays more rapidly, and the caries gradually approaches the central or pulp cavity, which at length is opened. Hitherto, there has been little or no suffering, but now pain is experienced under the action of irritant substances, heat, cold, etc. Inflammation proceeding to suppuration takes place; the pulp is gradually destroyed by ulceration; and the body of the tooth, thus deprived of its nourishment, decays and leaves nothing but the outer coating of enamel, which then breaks away by degrees, till nothing but the fangs of the tooth remain, and these usually cease to give pain. Caries is not only a common cause of toothache, but frequently gives rise to obstinate headache, pain in the ear, deafness, squinting, impossibility of bearing the light (photophobia), and other anomalous symptoms, which immediately disappear upon the removal of the diseased tooth. In these cases, the tooth may never have ached, but will be found painful when pressed up or smartly struck. The primary cause of caries is constitutional, and it especially occurs in scrofulous and ill-nourished persons, or in those whose health is broken down by too frequent pregnancies, prolonged lactation, the abuse of mercury, etc. The direct or exciting causes are usually described as: (1) Such as destroy the integrity of the enamel, and thereby expose the dentine to the influence of irritant substances; or (2) such as operate upon the vital susceptibilities of the dental tissues. Among the former are acids and other corrosive substances taken into the mouth, sour eructations, the attrition of opposing surfaces of the teeth, and all kinds of mechanical violence; while among the latter may be mentioned hot and cold drinks, especially when taken in quick alternation. The excessive use of sugar is also commonly regarded as a cause of the disease. Many of the best dentists,

however, deny that acids (when taken medicinally) or the abrasion of the enamel can give rise to caries.

With regard to treatment, it may be observed that if the caries be slight and recent, the decayed portion must be removed, and the cavity filled up with gold, as described in the article DENTISTRY. "But," says Dr. Druitt, who on dental matters always quotes the opinion of Mr. Tomes, one of the greatest scientific authorities on the diseases of the teeth, "if the decay has advanced far toward the pulp cavity, or has laid that open, it may be necessary first to employ aperients and tonics, and use some application to deaden the sensibility of the tooth, so as to enable it to bear the stopping, and to protect it meanwhile from contact with food and saliva." Many a useless visit to the dentist might be avoided, if the patient would take an aperient dose of epsom salts two or three consecutive mornings; and after cleansing out the cavity with dry cotton-wool, would insert twice a day a plug of that substance, moistened in eau de cologne, or still better, in either of the following solutions: (1) Mastic solution, formed by dissolving a dram of mastic in an ounce and a half of eau de cologne; or (2) Ethereal tincture of tannin, formed by dissolving a dram each of tannin and mastic in an ounce and a half of sulphuric ether. By these means a painful tooth may be often brought into a state in which it will bear stopping. The patient's sensations will warn him against drinking very hot or cold, or sweet or acid fluids, and against exposure to cold draughts of air. Whenever the teeth exhibit a tendency to rapid decay, general tonic treatment is indicated.

2. *Necrosis* is an affection which is characterized by blackness of the tooth and looseness in its socket. It may be caused by violence, accompanied with destruction of the nutrient vessels, or by inflammation of the pulp. If the tooth gives trouble, it must be extracted. Necrosis of the teeth is quite distinct from the very destructive necrosis of the dental alveolar processes and of the jaws generally, which results from the poisonous action of phosphorus fumes, or from the very similar affection which sometimes follows the eruptive fevers. For an account of the singular and terrible disease from which artisans employed in making lucifer-matches suffer, in consequence of their inhaling the fumes of phosphorus (probably in the form of phosphorous acid), which was first noticed in 1839, we may refer to a review of Von Bibra and Geist's exhaustive treatise (in German) on the subject in the *British and Foreign Medico-chirurgical Review* for April, 1848; and to an article on "Phosphorus Workers" in the fifth report of the medical officer of health. Reference is also made to the disease in the article PHOSPHORUS in this work. The necrosis and exfoliation of the alveolar processes and portions of the jaws in children, consequent upon the eruptive fevers, is accompanied by the shedding of the teeth; and according to Mr. Salter, surgeon-dentist to Guy's Hospital, who was the first to describe its true nature, is essentially the same as the necrosis in phosphorus-poisoning, and, like it, is the result of the local application of a specific poison, generated within the individual, to the vascular parts of the teeth. For a description of this remarkable disease, and of the treatment to be adopted, we must refer to Mr. Salter's article on "Exanthematous Jaw-necrosis," in Holmes's *System of Surgery*.

3. *Alveolar abscess* may be defined as a suppuration around the fang or fangs of a tooth, usually carious, accompanied by absorption of the bony walls of the alveolar process, and enlargement of the little sac of pus or matter, which gradually makes its way to the surface, "either along a canal by the side of the fang of the tooth opening at the edge of the gum, or through the gum itself at a point corresponding to the end of the root (or roots) of the tooth implicated. When, however, the fangs are unusually long, or the reflection of the mucous membrane from the gum to the cheek or lip is very superficial, this same discharge may burrow still more outwardly, and find its exit upon the surface of the face."—Salter, *op. cit.*, p. 2. When the discharge bursts, as it most commonly does, through the gum, the alveolar abscess is reduced to its simplest form, and is known as a *gum-boil*. When the discharge takes place in the region of the cheek or chin, the true nature of the case may easily be mistaken by a careless surgeon, who might refer the symptoms to bone-disease. The cause of this affection is either caries or necrosis. In its earliest stage the disease may be cut short by the extraction of the affected tooth, or even by the removal of the stopping, if the tooth is a stopped tooth. If it is desirable to save (for appearance's sake or otherwise) a threatened tooth, the gum should be freely leached, and hot fomentations applied to the swollen part of the face, and the system should be briskly purged. As soon as matter can be detected it should be allowed to escape by a puncture made through the gum—an operation which is followed by immediate relief, and by rapid subsidence of the swelling, although pus continues to be discharged for a considerable time. Indeed, the disease seldom ceases altogether till the offending tooth is removed. When the abscess shows symptoms of pointing on the face, the tooth must be at once extracted, and more serious surgical interference will probably be necessary.

4. *Toothache* is not so much a disease as a symptom of various morbid states of the affected part, which, for convenience, may be classed under this single heading. "Toothache," says Dr. Wood, "offers every possible variety in degree, character, and duration. The pain runs through all the grades which intervene between a slight sensation of uneasiness and unsupportable agony. It may be dull, aching, heavy, sharp, pungent, throbbing, grinding, or lancinating. It may be continued or paroxysmal, remittent or intermittent, and regular or irregular in its recurrence. It may come in

flashes, and as suddenly disappear; or may continue a long time with little variation."—*Practice of Medicine*, 4th ed. vol. i. p. 512. According to the various conditions which give rise to it, toothache may be divided into: (a.) *Inflammatory toothache*, which is almost always dependent upon caries. The inflammation may be seated in the pulp of the tooth, in the nerve-twigs entering the pulp-cavity, or in the periosteum investing its roots, and reflected over the interior of the alveolar cavity. There is generally some external swelling after the pain has continued for some time, and it occasionally extends to the salivary glands. The tooth is at the same time very tender, and any force applied to it aggravates the pain, which is also increased by hot and cold liquids taken into the mouth. When, as in the great majority of these cases, the pain is associated with caries, the best treatment is as follows: "Let the patient have a dose of calomel and colocynth; confine him to spoon diet; let him wash out the mouth with a solution of carbonate of soda in tepid water; let the gum around the tooth, and between it and its neighbors, if tumid and tender, be deeply scarified with a fine lancet; then let the cavity be filled loosely with a little bit of cotton-wool, dipped into the solution of tannin and mastic (for which the formula has been already given); and if the toothache be curable at all, this plan, with a little patience, will be almost sure to succeed. If the pain is very violent, half a grain of powdered acetate of morphia may be taken up with the cotton imbued with the tannin, which should be warmed before it is put into the cavity. As soon as the pain is relieved, the tooth, if of use, should be stopped with gold or amalgam; or if of no use, it should be extracted. It may be added that most of the violent, burning, empirical nostrums, such as creosote, oil of thyme, etc., although they may be of service when introduced in small quantity by a skillful hand into the carious tooth at the right time, can do nothing but mischief when employed indiscriminately, as they are by the vulgar."—Druitt's *Surgeon's Vade-mecum*, 8th ed. p. 458. (b.) *Neuralgic toothache* may occur either in sound or in carious teeth. It may be recognized by its occurrence in paroxysms at more or less regular intervals, and by its being attended with little or no swelling of the external parts. It is very common in the earlier months of pregnancy, and in persons of a general neuralgic tendency, and is often excited by changes in the weather. The treatment is the same as for neuralgia generally. After the bowels have been freely opened, chalybeates and quinine must be given in large doses, and frictions with veratrum or tincture of aconite (both of which are energetic poisons) may be carefully applied to the gum. (c.) *Rheumatic and gouty toothache* may occur in sound or in carious teeth in rheumatic or gouty persons. The constitutional treatment applicable to these diseases must be tried, together with the local applications already noticed.

5. *Falling of the teeth*, due to absorption of the socket, may be regarded as almost an ordinary consequence of old age; but it frequently occurs under the popular name of *scurvy of the gums* in middle age, although very seldom before the 80th year. True, scurvy, gangrene of the mouth, or mercurial inflammation of the gums, may cause the loosening of the teeth at any age; but there are two other conditions which lead to the same result. In one of these affections, the gums swell, and assume a deep red color, and the inflammation appears to be propagated into the alveoli, producing a thickening of the periosteum, and a consequent elevation of the tooth above its ordinary level. By frequently recurring attacks of this inflammation, the tooth is lifted out of its socket, while the gum retreats from the neck, and leaves a portion of the roots exposed. The tooth thus deprived of its support at length falls, after which the gum heals, and the patient is relieved. The remedies indicated are those tending to relieve inflammation of the gum, but they are seldom successful. In the other affection, there is conjoined suppuration of the gums and sockets, and the disease first shows itself by an oozing of pus from behind the edges of the gums when they are pressed. From the absorption of the sockets, and the simultaneous retreat of the gums, the teeth, as in the previous case, at length fall out, if they have not, for the patient's comfort, been previously extracted. Little can be done in the way of treatment in this form of the affection.

6. *Painful and difficult eruption of the wisdom-teeth* requires a few remarks. The cutting of these teeth is often accompanied by distressing symptoms, which may be protracted for months, or even years, unless surgical aid is called in. The difficulties "arise from the position occupied by these teeth, so close to the joint of the lower jaw, where the mucous membrane is reflected from the gums to the cheek and fauces; combined with the very common condition, that the jaw is not sufficiently elongated backward to allow the *dentes sapientie* to range in the horizontal series with the other teeth." This mechanical difficulty not only holds back these teeth in their bony bed, but it often prevents their proper direction of growth. As a consequence of these displacements in the upper jaw, it often happens that when the jaws are brought together, a bit of mucous membrane is nipped and pinched, leading first to ulceration and extreme tenderness, and subsequently to cicatrization and stiffness of the parts. From insufficient room in the lower jaw the crown only partially emerges through the gum, the first cusp coming through it, while the hinder cusps remain covered. This produces a terrible pinching of the mucous membrane over the tooth every time the jaws are brought in contact. Another troublesome symptom, often associated with the painful cutting of a lower wisdom-tooth, is spasmodic but continuous contraction of the masseter muscle, so as to keep the jaws nearly closed, and capable of only slight separation. The most distressing

result, however, is the suppuration that often attends the difficult eruption of the tooth. Even in ordinary cases, when none of these complications are present, there is often a good deal of diffuse and erratic pain in cutting a wisdom-tooth. It is unnecessary to enter into the treatment, which must be left entirely to the surgeon-dentist.

7. *Hemorrhage after extraction of teeth* has occasionally proved fatal, and is not very unfrequently a troublesome and even dangerous complication of the operation. In most of the recorded cases, there has been distinct evidence of the existence of the hemorrhagic diathesis, or, in other words, of a liability to bleeding profusely from the most trivial wounds. No better local treatment can be recommended than that which was suggested by John Hunter nearly a century ago. "In general, it will be sufficient to stuff the socket with lint, or lint dipped in oil of turpentine, and to apply a compress of lint or a piece of cork thicker than the bodies of the adjacent teeth, so that the teeth in the opposite jaw may keep up a pressure." Matico and saturated alcoholic solution of tannin may be equally efficacious as styptics, but are not superior to oil of turpentine. In some cases, the extracted tooth has been successfully replaced as a plug. The internal administration of astringents, such as tannin and oil of turpentine, should be combined with the local treatment.

8. The subject of *tartar on the teeth* has been considered in a separate article.

TEFF. See MEADOW GRASS.

TEFSA, TADLA, or TEDLA, a t. of Morocco, 135 m. n.e. of the city of that name, stands in the fertile, well-peopled district of Tadla, on the banks of the Um-er-Beg. It is one of the oldest towns of the country, and its manufactures of woolen cloths and shawls are important.

TEGÆA, an ancient city of Arcadia, Greece, said to have been founded by Tegeus, son of Lycaon. The inhabitants were noted for their courage, and were subdued by the Spartans only after a prolonged warfare. From Tegea came 3,000 soldiers to the battle of Platæa and disputed the place of honor with the Athenians. They supported the Spartans in the Peloponnesian war, but after the battle of Leuctra joined the league, the formation of which brought on war with Sparta. The city resisted the attack of Lycurgus, but was captured by Machanidas, and afterward retaken by Philopæmen. A good account of the place is given by Pausanias. Its ruins are to be found near the modern town of Tripolizza.

TEGNER, ESAJAS, a Swedish poet of high reputation, was born in 1782 at Kyrkerud, in the Swedish province of Wermland, and educated at the university of Lund, where he took the degree of M.A. in 1802. In 1805 he was appointed sub-librarian to the university, and lecturer on æsthetics. In 1811 the academy prize was awarded to Tegner's poem of *Soea*, or Sweden, which at once raised him to the rank of one of the most popular writers of his country. Prior to the appearance of this successful poem, he had written several spirited war-songs and national odes, which had attracted the favorable notice of the king and government. In 1812 he became professor of Greek, and at the same time was ordained to the pastoral care of the parish of Ståfje. During the next 10 or 12 years of his life, he devoted himself to the prosecution of his clerical duties, and the acquisition of theological learning, with an earnest and unwearying zeal which was scarcely to be expected from his previous indulgence in the pleasures of society, and his natural inclination toward the exhibition of a taste for coarse humor and equivocal puns. During this period, he composed his two famous religious idyls of *Prestvigelsen*, or the "Consecration of a Priest," and *Natvardsbarnen*, or "The Young Communicants," and wrote his *Axel*, a poetic romance, which is regarded by some Swedish critics as even superior to his *Frithiof's Saga*, of which the first cantos appeared in a literary journal, edited by the historian Gejer, under the title of the *Iduna*, and conducted under the auspices of the Gothic society, the leading object of which was to foster national literature, and put down the prevalent taste for the pedantic classical or foreign school of writing. In 1825 Tegner published the closing parts of *Frithiof's Saga*, which rather errs in the opposite direction, and follows too closely the ancient saga on which the tale is founded. But notwithstanding the inharmonious character of the composition, which may be regarded rather as a collection of many ballads and odes in various meters than as a complete epic, the *Frithiof's Saga* became the most popular poem of Sweden, and attracted to its author the admiration and notice both of his fellow-clergy and of the sovereign, as was evinced in 1824 by the clergy of the diocese of Wexio nominating him for the vacant bishopric, and the king at once appointing him to the see. In his place at the diet, as a member of the chamber of the clergy, he made himself conspicuous for his support of ultra-conservative views, in opposition to the extreme liberal doctrines which he had advocated in early life. His speeches in the chamber and on numerous other public occasions have a great reputation in Sweden and Norway, and are devoted to the discussion of questions of education, literature, and finance. In 1839 Tegner was proposed for the archbishopric of Upsala; but in the following year, he was seized with unmistakable symptoms of insanity, which had been strongly manifested in two of his brothers and other members of his family. Although, after a few months' confinement in an asylum, he was able to return to his work, his health soon broke down; and after lingering for many months in a paralytic condition, he died in 1846. His collective

works were edited by his son-in-law, Prof. Böttiger, and published in 6 volumes (Stock, 1848). All his larger and more popular poems have been translated into German, French, and English; the English translations of his *Frithiof* are very numerous, three or four new ones having appeared between 1873 (Spalding's) and 1879. Longfellow's is well known.

TEGUCIGALPA, capital of Honduras, Central America, is situated on the Rio Choluteca, in a table-land 3250 ft. above the sea, and 60 miles from its port of Amapala, on the gulf of Fonseca. Tegucigalpa is the largest and finest city in the state. It has a university, library, ladies' seminary, etc. In the vicinity are gold, silver, copper, iron, and coal mines. Pop. about 12,600.

TEHA'MA, a co. in n. California; drained by the Sacramento river, and by Antelope, Red, Cottonwood, Beaver, and other creeks; traversed by the Southern Pacific Co.'s railroad; about 2988 sq. m.; pop. '90, 9916, chiefly of American birth. The surface between the offshoots of the Sierra Nevada in the e. and the Coast range in the w. is a plain without timber. The soil in the central parts is fertile. The principal productions are corn, barley, wheat, wool, live stock, and wines. Co. seat, Red Bluff.

TEHRAN', or **TEHERAN**, capital of Persia and of the province of Tehran, situated in a barren plain 70 m. s. of the Caspian sea. On the n.e. runs the lofty range of the Elburz mountains, rising in Demavend to a height of 18,000 ft. above sea-level. Until recently the town consisted almost entirely of mud houses, packed within a mud wall 20 ft. high and 4 miles in circumference, but within the last ten years Tehran has been very much modernized, the narrow irregular streets giving place, to a large extent, to wide avenues and boulevards planted with trees, and open squares. The old walls have been replaced by earthen ramparts, which enclose nearly double the territory. A considerable portion of the city, however, is still narrow and dirty. In the midst of the northern quarter lies the great fortified palace of the shah, with gardens, lakes, arsenal, prisons, military school, etc. The city has numerous mosques, a normal school with library, founded in 1850, large modern bazaars, and numerous baths. Its industries are of merely local importance. The population is estimated at about 120,000, which in winter, when the court is at Tehran, is increased to 200,000. Tehran is the most important place in Persia, both as the court residence, and as being the center of European commerce with the east. By the construction of numerous underground water-courses, the formerly arid region surrounding the city has been made inhabitable, and numerous villages and palaces have been erected. In the neighborhood lie, among others, the royal pleasure palaces, Negristan, with beautiful gardens, Kasrkadshar, and Niaveran. To the s. lie the ruins of Rei, the *Rhages* of Scripture, known in the time of Alexander the Great, under the name of *Ragae*, and the birthplace of Harûn-er-Raschid.

TEHUANTEPEC', a river port of the s. of Mexico, in the territory of the same name, and 13 m. above the mouth of the river Tehuantepec, in the bay also of that name. Pop. (est.) 8000. The staple products are salt, cotton fabrics, cochineal, and indigo. Pearl-fishing is carried on, and a purple dye is procured from a shell-fish which abounds in the vicinity.

TEHUANTEPEC' CANAL. See **INTEROCEANIC SHIP CANAL.**

TEHUANTEPEC', ISTHMUS of, that geographical division of Mexico which extends between the gulf of Mexico and the Pacific ocean, in an e. and w. direction, and includes the political divisions Vera Cruz and Oaxaca. It comprises the Atlantic plains, which lie along the foot of the Cordilleras, on the gulf; the central mountainous districts; and the Pacific plains on the west. The basin of the Cootzacalcos, and the contiguous territory, on the e. is a highly fertile alluvial country. This river rises in the Sierras, is navigable 80 m. from its mouth; and is important as offering one of the means for the projected canal connection with the Pacific. The Pacific plains average about 20 m. in width, descending gradually from the mountains. The population of the isthmus, principally Indians and half-breeds, numbers about 62,000; its productions are maize, coffee, cocoa, indigo, cotton, sugar, and tobacco. On the gulf side there are extensive forests of mahogany, cedar, gum, and india-rubber trees. On the western plains are great herds of cattle. The city of Tehuantepec on the river of the same name—which is merely a mountain torrent, thus dignified—is the second town in importance in the state (Oaxaca), and has about 13,000 Indians and half-breed inhabitants, with a few Spaniards. It is situated 11 m. from the Pacific; contains 16 churches, one of which was built by the last Zapoteco cacique in 1530, and possesses manufactures of pottery, cotton, shoes, hats, saddlery, etc. A portion of the isthmus was carefully surveyed by Cortes, who was seeking for an opening to the South sea—the great *desideratum* of the early Spanish navigators to America. Cortes, in fact, was the first to conceive of a method for connecting Asia with western Europe, *via* this isthmus. See **INTEROCEANIC SHIP CANAL.**

TEÏDE. See **MONITOR.**

TE IGITUR, one of the service-books of the Catholic church. It is properly but an extract from the Roman missal, and contains the canon of the mass, and certain other portions of the liturgy which do not vary with the variety of festivals or of the ecclesiastical seasons, but are always the same. It is so called from the first words of the canon, *Te igitur, clementissime Pater*. This service-book, as distinct from the missal, was used, and is still used by bishops, prelates, and other dignitaries; and as the "canon" is the most sacred part of the service, oaths upon the *Te Igitur* were regarded

as especially solemn. The *Te Igitur* appears to have been used as the ordeal "of compurgation."

TEIGNMOUTH, a seaport, market t., and favorite watering-place on the s. coast of Devonshire, situated on the English channel, at the mouth of the Teign, 15 m. s. of Exeter. In front, on the seaside, is the wide, grassy esplanade known as the *Den*, formed of a huge bank of sand, accumulated at the river's mouth, and from this a handsome pier runs out into the sea. The harbor is safe and commodious, though difficult of entrance, the channel of the river being obstructed by a shifting bar of sand. The chief imports are coal and culm; the exports, granite from Dartmoor, and china-clay; there is also a considerable sea and river fishery. Teignmouth is connected with Shaldon, on the other side of the river, by a wooden bridge (completed in 1824) of 34 spans, 1671 ft. in length, with a swing over the main channel for the passage of ships. The climate is mild and salubrious, and the country around beautiful. It is a station on the South Devon railway. Pop. '91, 8292.

TEJADA. See **LERDO DE TEJADA**.

TEKELI (more properly, *Tökely*), **EMERIC**, Count, a celebrated Hungarian patriot, was descended from a noble Lutheran family, and was born at the castle of Kasmark, in the county of Zips, in 1656. His father, count Stephen, had been implicated in the conspiracy of Zriny and Ragotsky to free Hungary from the rule of Austria; and after his death, and the execution of Zriny and others, young Tekeli sought an asylum in Poland, where he had large possessions. After vain endeavors to recover from the emperor his patrimonial estates, he repaired to the court of Abaffi, prince of Transylvania, who put him at the head of an army of 20,000 men, with which, in 1678, he invaded Hungary. Being joined by numbers of the malcontents, he rapidly extended his conquests, made predatory inroads even into Austria, Styria, and Moravia, till Leopold I. was forced (1681) to temporize with the insurgents, and thus gained over a portion of them. But Tekeli, distrusting with good reason the emperor's sincerity, refused to disarm, and being joined by the Transylvanian prince and the Turks, he was declared by the sultan Mohammed IV. (1682) king of upper Hungary, and again recovered most of the country. Tekeli joined Kara Mustapha in his celebrated inroad upon Austria; but after the failure of the expedition many of his followers fell off from him, and his patron, the sultan, being prejudiced by his enemies against him, he was twice imprisoned by the Turks; and during his detention Hungary was wholly overrun by the Austrians, and Transylvania separated from the Turkish alliance. Tekeli, however, was favored by a brilliant though ephemeral change of fortune in 1690, when, at the head of a Turkish force, he burst into Transylvania, routed the combined Austrians and natives repeatedly, and woke up the energies of his partisans in Hungary; but the imperialists, under the markgraf of Baden, routed his allies, the Turks, at Salankemen (Aug. 19, 1691), and under Prince Eugene of Savoy, so completely demolished them at Zenta (Sept. 11, 1697), that they gladly agreed to the peace of Carlovits (Nov. 14, 1697), by which all aid to the Hungarian malcontents was withdrawn. From this time Tekeli lived in retirement in Turkey, at first being munificently entertained by the Turkish government, but afterward so completely neglected that he was forced to adopt the occupation of a vintner. He died at Constantinople in 1705.

TELAUTOGRAPH. A telegraphic system for the fac-simile reproductions of handwriting. This apparatus, which was invented by Elisha Gray, consists of a transmitting and a receiving instrument, each at its station, the two connected by two conducting wires. When the instrument at the transmitting station is written upon in ordinary handwriting, the same is reproduced in fac-simile by a pen, which works automatically on the receiving instrument. Two cords at right angles to each other are connected at the point of the transmitting pencil, which thus give motion to the mechanism as the pencil moves. The motion of a permanently magnetized steel gear-wheel in front of an electro-magnet produces pulsations in the circuit between the machines. The receiving instrument contains an electric motor driven by a local battery, and the pulsations in the circuit control an escapement-wheel driven by the motor which moves the receiving pen so as to make an exact reproduction of the writing on the sending instrument. Both pencils move in unison. The machine has worked satisfactorily over distances of several hundred miles.

TELECTROSCOPE, an apparatus invented by M. Tenlecq, of Andres, France, to reproduce telegraphically at a distance the images obtained in the camera obscura. A camera obscura is arranged with an unpolished glass at the focus, with an arrangement also for autographic telegraphic transmission—the point of the transmitter being made of selenium, which is capable, in a marked degree, of electrical resistance when brought into contact with the light. This point of selenium is made to trace along the unpolished surface of the glass, lightened with variable intensity; the point thus minutely informs the receiver (a tracing-point of black lead joined to a thin plate of iron, and made to vibrate by the current sent through the line which connects with one of the springs holding the selenium) of the light-vibrations; and the lead receiver, in turn, prints these vibrations on a small sheet of paper, ingeniously attached to it. The apparatus possesses much theoretic interest, but has seldom been put to practical use.

TELEPU, *Mydaus meliceps*, a quadruped of the weasel family (*mustelidae*), a native of the mountains of Java, at an elevation of 7,000 ft. and upward; remarkable, like the skunk (q. v.) of America, for the excessive fetor of a volatile secretion formed in glands situated a little within the rectum, the emission of which is its principal means of defense.

TELEGRAPH (Gr. *tele*, far off, and *grapho*, to write) is a general name for any means of conveying intelligence other than by voice or writing. The idea of speed is also implied. It is now used to mean exclusively the transmission of messages over a wire by means of electricity. Alarm-fires (see **BEACON**), the semaphore (q.v.), and the signals (q.v.) used at sea are among the earlier forms of telegraph. But all other agents are now entirely surpassed by the electric telegraph.

The practical application of the scientific laws under which the telegraph operates—in the form of the instrument still, with certain modifications, in general use—is supposed to have been first made by S. F. B. Morse (q.v.) in 1832-35. With the discovery that electric currents could be transmitted instantly over long distances came the idea of employing them for signalling, and in 1774 Bishop Watson made some experiments in discharging leyden jars through 10,600 feet of wire suspended on wooden poles in the neighborhood of London. In the *Scotts Magazine* in 1753 a detailed description of a plan for electric telegraphy is given, and in 1774 a telegraph line was erected at Geneva, Switzerland, which consisted of twenty-four wires connected to pith-ball electroscopes, each representing a letter. The difficulty of using frictional machines, however, prevented the attainment of any practical results in this direction before the discovery of the voltaic cell. In Germany the invention of the telegraph is credited to Sömmering of Munich, whose original apparatus, built about 1811, was exhibited in operation at the Congress of Electricians at Frankfort, Germany, in 1891. Baron Schilling in 1832 exhibited a telegraphic model in Russia in which the letters were represented by the deflections of a single needle. Weber and Gauss modified this plan by using a magnet suspended horizontally, to which a mirror was attached. Steinheil of Munich was the first to notice the important fact that by using the earth as a conductor no return wire is needed. He also invented a code using but two elementary signals in different combinations, and an instrument for recording the characters on a moving strip of paper in the shape of two rows of dots. The telegraph was established as a commercial enterprise in Germany with Steinheil's system, in America with Morse's, and in England with Wheatstone and Cooke's. The first telegraph line in commercial operation was between Paddington and Drayton, in England, in 1835, and was 13 m. in length. This antedated by seven years the Morse line, which was laid between Washington and Baltimore. The printing telegraph was first invented by Alfred Vail, of New Jersey, in 1837, but it was not until 1841 that Wheatstone made his first model of the instrument. In 1845 Mr. C. J. Fleischmann exhibited the Morse apparatus to the emperor of Austria, at Vienna, and with such success that it was adopted by the Austrian government. In 1848 two Americans built a line between Hamburg and Cuxhaven at the mouth of the Elbe, a distance of 90 m., which was operated on the American plan with Morse instruments, and was employed for reporting marine news. The Wheatstone apparatus did not work well except through comparatively short distances, and at a very low rate of speed, and was altogether inferior to the Morse telegraph. The superior efficiency of the latter in working direct through long distances was caused by the application of the relay and local circuit. In Oct., 1851, a convention of deputies from Austria, Prussia, Bavaria, Württemberg, and Saxony met at Vienna to effect a common and uniform telegraph system. By this convention it was decided that the Morse system was practically the best, and this was therefore adopted. In the beginning of Morse's experiments he made use of the fountain pen and other devices for recording the characters; but in the end, the stylus or steel point for embossing these was found to be the most convenient and satisfactory.

The space at our command will not permit us to describe the various steps which led to the introduction of the perfected telegraph. We must be content to furnish a description of the apparatus and methods now in use, and to give some statistics showing the growth of the business and its present extent. In our description of instruments, etc., we shall assume the reader to be familiar with the chief features of electricity (see **GALVANISM**) and of electro-magnetism (see **MAGNETISM**). The apparatus first developed by Prof. Morse depended upon the principle brought out by Prof. Henry, that a piece of iron when wound with wire will exert magnetic attraction as long as a current of electricity sent along the wire is passed through the coil.

The temporary magnetic attraction so produced was used by Prof. Morse to impart a slight movement to a lever placed near the magnet, thereby giving a visible indication each time that the current was sent through the wire at the distant station. Different combinations of charges of current, each one being of only momentary duration, were arranged to represent the letters of the alphabet, and by this means messages were spelled out by short impulses or dots of current over the wire from Washington to Baltimore. This is the foundation of all electric telegraphs. The application of the principle is modified in innumerable ways, for the purposes of permitting the transmission and the reception of the messages to be done in various ways that are convenient for special places and uses. The numerous instruments so employed may be classed under two heads—namely, those which record the signals so that they may be read at any time after the message is received, and those which give only a passing signal, indicated by a sound or a motion, and which therefore require the constant attention of a receiving operator. Among the former are several kinds—namely, those giving a record in arbitrary signs—i.e., in the dots and dashes of the Morse alphabet; those which print the message in ordinary type, such as the modern type-printing instrument, of which the Phelps printer

is the most common, and lastly a class of instruments giving a fac-simile of the message. The last class is not much used, and the instruments which print in type, though used extensively, are confined to main offices where a great many messages are sent rapidly over long lines. We have not space to describe these instruments. See Prescott's *Electricity and the Electric Telegraph*. The greater part of the telegraphing of the world is done by the Morse non-recording instruments, that is the Morse sounder and key, as they are called, and to these we shall therefore devote the greater part of our description, referring the reader to the illustration plate TELEGRAPH INSTRUMENTS.

The Morse Telegraph and Morse Instruments.—The leading principle in the Morse instruments is that by the depression of a key, or by other means, at the sending station an electric circuit is "closed" or completed, and a signal is transmitted along the wire to a distant receiving station, where on its arrival it reproduces the signal by the action of an electro-magnet, or otherwise.

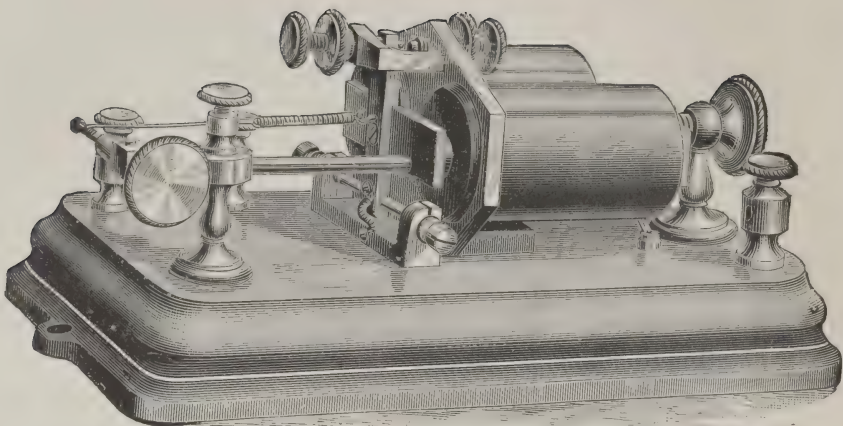
Electrically, the Morse system consists of a battery or other source of electricity and a wire, with the instruments connecting the telegraph stations and returning to the battery. This is done so that a current of electricity is kept in continuous circulation in the wire except when interrupted. A signalling outfit at each office is connected to the wire, and consists of a key for interrupting the current, and thereby producing signals throughout the entire length of the wire, and a receiving instrument or sounder, consisting of an electro-magnet with a responsive lever, which is attracted by the magnet making an audible click when the current passes.

The sounder, fig. 4, consists of a small magnet wound with insulated wire and firmly attached to a base. In front of the poles of the magnet a bar of soft iron, suitable to be attracted by it, is supported by a lever, pivoted at one extremity in such a way that the lever is free to descend and allow the keeper to approach the magnet when attracted by it. The weight of the lever and of the keeper are counterbalanced by a spring which is made adjustable, and is always so adjusted that the keeper is kept away from the magnet by a slight pressure. The motion of the lever, upward and downward, or toward and from the magnet, is limited by adjustable stops. When the keeper and lever are attracted downward by the magnet an audible click is produced by their striking the downward stop. When the keeper is released by the magnet and carried back by the pressure of the spring another click is produced by its striking the upward stop. These clicks are always different in sound, so that the skilled operator has no difficulty in distinguishing an upward from a downward stroke of the lever. The length of wire wound upon the magnet is always proportionate to the length of the line, in order to get the best effect.

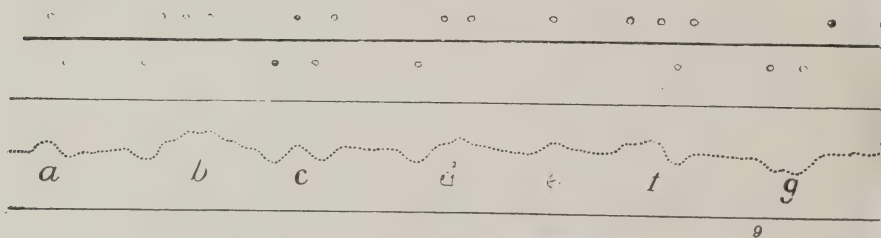
The Transmitting Key.—The "key" by which signals are transmitted from the operator at the sending office is shown in fig. 3 in its most improved form. It consists of a lever pivoted near the middle and carrying at one end a knob by which it is manipulated upward and downward by the operator in sending signals, or "writing," as it is sometimes called. Two platinum contacts are fastened respectively to the under side of the lever and to an insulated piece on the upper side of the base. These contacts are exactly opposite to each other, so that they come together every time the key is depressed. The lever is held up and the contacts therefore kept apart, when the key is not depressed by the operator, by a small spiral spring which presses upward under the lever. One end of the line wire is connected to the metallic base from which the current may pass through the pivots to the lever and thence to the small contact point attached to the underside of the lever; and the other end of the line wire is connected to the small insulated piece supporting the lower contact. By this arrangement no current can pass through the line until the key or lever is depressed. Since the terminal of the wire which is fastened to the lower contact is insulated, the current has no means of reaching the other part of the wire. When it is desired to send the current the handle is depressed, and the current generated in the battery, finding a passage between the two contacts, passes from one end of the wire to the other and proceeds upon the line wire to the distant station. Various modifications of this key are in existence, but in all the principle remains the same, that the electric circuit is closed or completed by the depression of a key. The length of time during which the handle is depressed determines the length of time between the upward and downward clicks of the sounder at the other end of the line. Thus if the operator presses down the handle and releases it quickly, the keeper of the sounder will go down and up, immediately indicating the letter "E," while if he presses the key and holds it down a moment before releasing it, there will be a longer interval between the downward and upward clicks of the sounder, and the letter "T" will be produced. In early instruments, before the operators had learned to read the messages by the clicks, the receiving instrument was arranged to make a record of the signals upon a moving strip of paper. For this purpose a pen or pencil was attached to the lever of the sounder, and a strip of paper, kept in motion by clockwork, was arranged to pass under the pen, so that a mark was produced by the pen every time the lever was pulled down by the magnet. If the lever was immediately released a dot was recorded, but if the lever was held down a moment a longer mark called a dash was produced.

Fig. 2 shows such a recording Morse instrument with the letters "H. I. P." written upon the tape. It is of the most improved pattern, being arranged to start and stop the tape automatically. All of the delicate parts are under glass. The signals used at first were

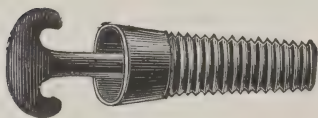
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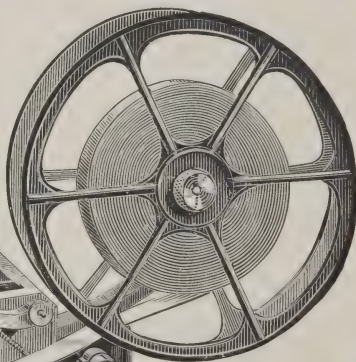
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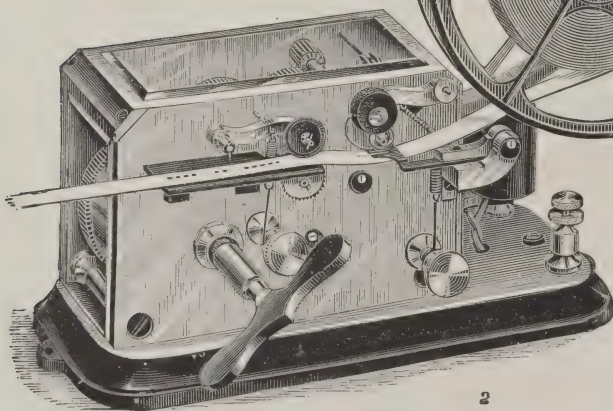
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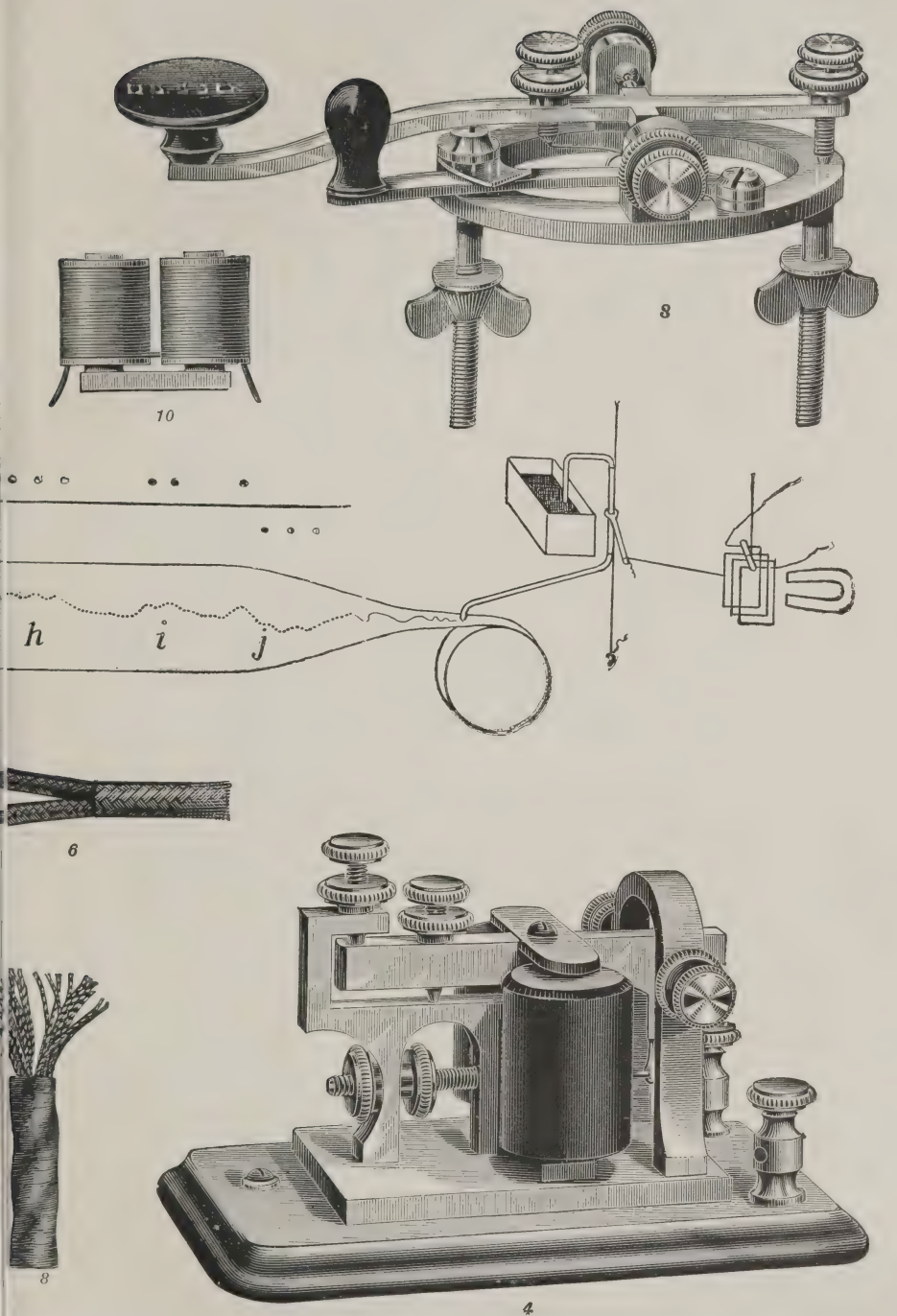


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7

TELEGRAPH INSTRUMENTS.—1. Relay. 2. Modern Morse printer. 3. Key for transmitting wires to poles. 6. Double wire insulated. 7. Insulator for holding wire on house set of receiving instruments used on ocean cables, with alphabet as sent out and as acting instruments.



ing or "writing." 4. Sounder for receiving. 5. Hook support, or insulator for attaching
8. Insulated flexible cable of fine wire for connecting movable instruments. 9. Diagram
y recorded on receiving tape. 10. Electro magnet, forming basis of all telegraphic receiv-

arranged for making the record with a crude instrument of this kind, and while the increasing skill of the operators now enables them to read the signals directly from the clicking of the instrument without looking at the tape, the signals are still spoken of as consisting of so many dots and dashes, as if recorded upon paper.

The Morse Alphabet.—Before going further the details of the alphabet may be given. The only elements which can be combined for making telegraphic signals in the Morse system are the dot, the dash, and the space, and the alphabet is made up of the simplest combinations of these that can be made. The preference of the shortest combinations is given to the letters which are most frequently used. It is stated that Prof. Morse founded his alphabet upon information given him by his brother, a journalist, as to the numerical relation of the letters in the English alphabet. The simplest signal, a dot, being given to "E" and the next simplest, a dash, to "T," those letters occurring most frequently in our language.

AMERICAN MORSE CHARACTERS.

| | | | | | | | |
|------------|---|-----------|-------------|-----------|----------|-----------|---|
| · | E | — | T | · — | A | — · | N |
| ·· | I | — — | M | ·· — | U | — · · | D |
| ·· · | S | — — — | 5 | ·· · — | V | — · · · | B |
| ·· · · | H | — — — — | L or cipher | ·· · · — | 4 | — · · · · | 8 |
| ·· · · · | P | | | | | | |
| ·· · · · · | 6 | | | | | | |
| · · | O | · — · | F | — — · | G | | |
| · · · | R | · · — | Q | — — — | ! | | |
| · · · · | & | · · · — | 3 | — — · · | 7 | | |
| · · · · | C | · — · · | X | · — — | W | | |
| · · · · | Z | · · — · · | 2 | · — — — | 1 | | |
| · · · · | Y | | | · · · · · | "Period" | | |
| | | | | — · — | K | | |
| | | | | — · · · | J | | |
| | | | | · — — — | "Comma" | | |
| | | | | · · · — | 9 | | |
| | | | | — · · · · | ? | | |

Owing to the fact that in some of the early telegraphs used in Europe the space could not be employed as part of any of the signals without causing confusion, it was necessary to rearrange the combinations of dots and dashes, so as to form the whole alphabet with the dot and dash without the use of the space. This alphabet is known as the continental Morse alphabet. It is used throughout Europe and in all submarine telegraphy.

CONTINENTAL MORSE ALPHABET.

| | | | |
|--------------|---|--------------|----|
| · | E | — | T |
| ·· | I | — — | M |
| ·· · | S | — — — | O |
| ·· · · | H | — — — — | Ch |
| · — | A | — · | N |
| · — — | W | — · · | D |
| · — — — | J | — · · · | B |
| · · — | U | — — · | G |
| · · · — | V | — — · · | Z |
| · · — | R | — · — | K |
| · · · · | L | — · — · | C |
| · — — · | P | — · — — | Y |
| · · — · | F | — · · — | X |
| | | — — — — | Q |
| 1, · — — — — | | 6, — · · · · | |
| 2, · · — — — | | 7, — — — · · | |
| 3, · · · — — | | 8, — — — · · | |
| 4, · · · · — | | 9, — — — — | |
| 5, · · · · · | | 0, — — — — — | |

The Battery.—For the generation of power in the electric telegraph, the gravity batteries (see GALVANIC BATTERIES) are chiefly employed in this country. Various forms of the Daniell battery are also used, especially in Europe. The power employed varies with the length of the line, the condition of the wires as regards insulation and the nature of the instruments used. It is now becoming quite common in this country, especially in cities where many lines center, and therefore where considerable quantities of electricity are used for telegraphing, to employ dynamos driven by steam engines for generating the current in place of batteries. In this way in New York galvanic batteries have largely been displaced by dynamo electric generators.

The Circuit.—The mode of joining up two or more stations by means of the line wire is shown in fig. A. It being necessary to furnish a complete circuit or path for the current from the battery over the line and back to the battery, a return connection is required, as mentioned before. But in practice, in telegraph work this return connection is made by simply connecting the instruments at the distant station with the earth, and allowing the current to come back to the battery by this means.

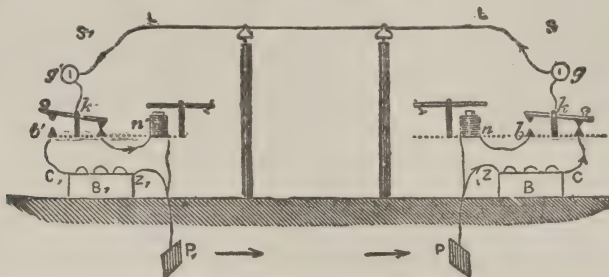


FIG. A.

Assuming S and S₁ to be telegraph stations, P and P₁ are the earth-plates (see subsequent paragraph), B and B₁ are the batteries; *n* and *n'* the sounders, consisting of electro-magnets, with their armatures, while *b k* are the transmitting keys. The connection at the key is always completed by a supplementary switch, when the key is not being used to send a message, in order that the path may be complete for the reception of any message from the other office.

The station at the right in the diagram is now supposed to be sending a message.

Whenever this key is depressed, a current of electricity will pass from the battery, B, along the line wire, around the magnets *n n'*, drawing up the levers and making a click; thence down to the earth-plates, P P₁, and through the earth back to the battery.

Supposing then that the operator desires to send a message along the line wire L L, he depresses his key several times, so as to send a series of dots and dashes corresponding to the letters to be sent to the distant station. These are heard by the receiving operator, who writes down their meaning as fast as received.

The Line.—From the same figure some idea may be gained as to the mode of carrying a wire or series of wires over posts, these posts being carried along the sides of a road or railway. In towns, wires are carried "over-house," or by underground pipes, the wires in the latter case being insulated by means of a gutta-percha or other suitable covering. The subterranean method is being applied to extended lines, especially in Germany, and is found to answer as well as the over-head system, while it avoids many of the casualties to which the latter is liable. In pole and over-house lines, the wires are kept from each other and from contact with the earth by insulators of various kinds. White porcelain and brown stoneware are the chief materials used, and the former, when it is of good quality, well glazed and well burned, is perhaps the most perfect of all insulating materials, and does not deteriorate with age. The fewer the poles are in number on which the wires are suspended, the better is the insulation and the less the cost, but the liability to accident is probably greater. The number of poles used varies from 16 to 30 per mile, and is governed by the number of wires carried, the configuration of the track, and other considerations. On road lines, the number of poles is generally larger than in the case of telegraphs carried alongside railways, the greater levelness and straightness of the latter reducing the number of supports required. The wire chiefly used for inland telegraph purposes is of iron, galvanized, and of No. 8 ($\frac{3}{8}$ in.) gauge. The conductivity of a wire increases in the ratio of the square of its diameter (the resistance decreasing in the inverse ratio), and the advantage of using a thicker wire on the longer lines is thus seen. No. 4 wire is, for this reason, used on some of the longer lines.

The Earth—Earth Currents.—Mention has been made of the "earth," in the preceding description. This is the technical expression used in relation to the fact discovered by Steinheil in 1838, that the earth itself serves the purpose of completing the circuit, and renders the employment of a second or return wire unnecessary. The "earth" may consist of a buried plate of metal connected with the battery or line-wire, and of sufficient surface to afford the necessary contact, with sufficient earth to make a good connection, it being understood that a small quantity of earth does not conduct well. The gas or water pipes of a town form excellent "earths," care being taken that the connection is made with the pipe itself, and not with a branch, where a badly made joint might spoil the connection. Where dissimilar "earths" are in use, as, for instance, a copper plate at one end and an iron pipe at the other, a quasi battery is created, and minute currents pass along the line; these, however, are too weak to be of consequence. The earth, being of great size, offers no sensible resistance to the passage of the current, in the same way that a large wire offers less resistance than a thin one. While this quality of the earth

is one of the most valuable aids to telegraphy (reducing so materially the cost of wire erection), it presents at times those embarrassing interruptions known as *earth currents*. These currents, at all times unwelcome visitors to a telegraph office, are very variable, changing rapidly at times from positive to negative, altering their direction with the hour of the day, and leaving one circuit to appear on another in a manner not explainable. The lines most liable to such disturbances are those running n.e. and s.w.; that is, connecting places separated in a straight line in those directions, and without reference to the actual direction of the wires. The easiest remedy for earth currents, when they are of sufficient strength to affect the lines, is to dispense with the earth connection and revert to the original plan of using two wires. Thus, between places where there are two wires, both may be disconnected from "earth," and used as a complete metallic circuit. Another remedy has been found in extending the circuit by joining to it a further wire, the terminal point of which lies beyond the direction or line in which the earth current is flowing. We must refer to the larger treatises on telegraphy for information regarding lateral induction, velocity of electric discharge, the tests for resistance, insulation, etc., and also for notices of some of the less prominent pieces of apparatus now found in the instrument room of the electrician.

The Relay.—We now proceed to notice several methods by which the transmission of signals is facilitated or accelerated. First among these may be placed the *relay*. In the previous description of the Morse, we have assumed the instrument to be worked directly by the current sent along the line. On long circuits, however, direct working could only be accomplished by great battery power, as, owing to inevitable loss by leakage, a current loses greatly before it reaches its destination. It is found to be a much better arrangement to have the instrument worked by a "local current," derived from a local battery at the receiving station. This is accomplished in the following way: The receiving instrument connected to the line instead of being made heavy enough to give an audible sound by which the signals may be understood, is made extremely light and delicate so that it can be operated by a weak current.

To the lever, which responds and is attracted by the magnetism, is attached a contact point which strikes another stationary contact when the lever is drawn towards the magnet, fig. C, closing a circuit through these extra points in precisely the same way that the usual signalling key is worked. These contacts are connected by short wires with a regular sounder and a small battery. Whenever the delicate lever of the relay is attracted it closes this extra or local circuit and causes the sounder to respond to every signal precisely as if it were connected directly to the main line.

By this device of using a delicate instrument to set another in operation, it is practicable to reproduce faint signals upon a large scale. The use of the "sounder" has greatly increased in this country owing to its cheapness and efficiency. For a description of the type-printing and *fac-simile* instruments, on which great advances have been made of late years, we must refer our readers to the larger treatises on the telegraph and its history.

Duplex-Working.—The fact that two currents may be sent simultaneously (one from each end) has been long recognized by electricians, but the principle of the duplex was revived and patented by Stearns, an American, in 1872. At first the duplex-working was only tried on short circuits of 40 to 60 m.; but it has now become a matter of daily use on every busy circuit, long or short, both in this country and abroad. The principle of the duplex telegraph, which is an apparatus for sending messages simultaneously in different directions over a single wire, may be briefly described as follows: It is accomplished by connecting two complete sets of telegraph instruments to the wire at each end, and so connecting and adjusting one of them that it is only sensitive to the impulses which come *out of the wire*, having traveled over it from the distant end, while the other set, operated by another man, sends signals *into the wire*, which travel to the distant station without producing any effect upon the first set of instruments just mentioned. To accomplish this the current sent on the depression of the key is divided into two parts, one half being carried through one pair of coils in a differentially wound sounder, to the line, and the other half through the other pair of coils to a resistance coil, and thus to earth. The resistance of the latter is made exactly equal to that of the line-wire, and the instrument of the sender being so placed that this divided current presses equally in each direction, this instrument remains unaffected, while the armature at the other end responds to the signal sent. At the same time an operator at the other end is sending a current, which is divided in like manner, and leaves his own instrument unaffected while operating on the armature of the first instrument. The two currents on the line-wire assist or oppose each other in such a way as to affect the equilibrium in the differential sounder, but each operates only on the distant instrument. Duplex-working led to *duplex*, that is, two messages passing over a wire in the same direction at once, and to this has followed quadruplex and multiplex telegraphy. Quadruplex-working was first perfected in 1876 by Prescott, Edison, and Gerritt Smith, but the possibility of its being accomplished was suggested by Stark, of Vienna, in 1855. It was introduced into Britain as a practical branch in 1878, and is now used from London to Liverpool, Dublin, and other towns. An illustration of the value of these additions to the wire power is afforded by a wire from Chicago to Pittsburg, 550 m., which is quadruplexed, and at Pittsburg branches off in two duplex circuits to Baltimore and Philadelphia, giving Chicago duplex communication with these two places. In the same way Middlesborough and

West Hartlepool have been duplexed to London, on separate wires as far as Leeds, and quadruplex on one wire thence to London.

Multiplex Telegraphy and "Phantom" Circuits.—The most original feature of the telegraph section of the Paris exhibition of 1878 was the harmonic telegraph of Haskins and Gray, based on principles laid down by Cromwell Varley in 1870. In one application it occupies a place midway between duplex and multiplex telegraphy, namely, in the "way duplex," or as it was felicitously termed by the late Mr. Orton, the "phantom circuit." A wire may be occupied by the ordinary business of a series of intermediate offices, while there may be superimposed on that a through traffic (which can be duplexed) between the terminal stations. Thus between Chicago and Dubuque, a wire provides for 17 intermediate stations working ordinary Morse sounders, while the harmonic telegraph (the principle of whose action is vibratory currents sent and received by musical forks tuned in unison) works between the terminals. By an extension of this principle we have the multiplex telegraph, each fork taking off at the receiving end those vibrations corresponding to its own tone.

One of the principal instruments used for the purpose of distinguishing different messages which are sent over a wire at the same time is the polarized relay. The object of the instrument is to distinguish between messages sent with a positive current and those sent with a reversed current. Thus two such instruments can be placed in an office, connected to the same wire and adjusted so that one will respond only to the messages sent with the positive current while the other will respond only to those sent with a negative current.

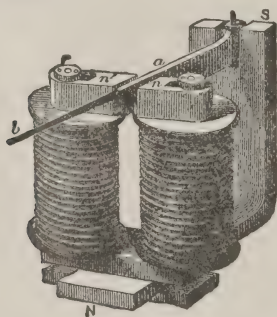


Fig. B.

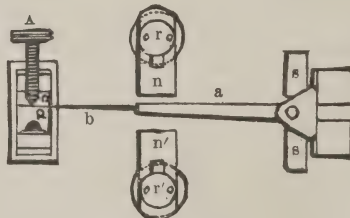
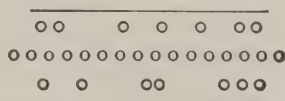


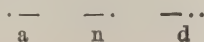
Fig. C.

The way in which this is arranged will be seen from the figs. B and C. In these N, S is a hard steel permanent magnet whose south end, S, has a slit in which the soft iron armature *a* is pivoted. To this armature a thin aluminium tongue, *b*, is attached, which by making contacts on either side completes either of two local circuits, and operates either of two sounders, according to which side the tongue is attracted to. The coils of the magnet are so connected that a positive current attracts the tongue to one side, while a negative current attracts it to the other.

Automatic Transmitter.—The speed of the ordinary Morse instrument is limited to the rapidity with which the hand of the operator can move the key, so as to preserve the proper spacing between the marks at the receiving instrument. To overcome this we now have an apparatus which trebles, and in some cases quadruples the carrying capacity of a wire, securing, at the same time, mechanical accuracy in the relative size of the dots, dashes, spaces, etc. To effect this, three different instruments are required: First, there is a perforator, by which holes are punched in a paper slip to correspond with the signals required. The operator strikes three disks, the central one producing a central hole, which is of no avail electrically, only carrying forward the paper; the left-hand disk producing two holes, directly opposite to each other, on the sides of this central row, and that on the right producing two holes, placed diagonally to each other. The passage of the electric current is regulated by the position of the outer holes. Those opposite each other admit of a momentary passage of the current through the "transmitter" used in sending the message, while the holes diagonally placed produce a lengthened mark corresponding to the dash. The following diagram represents the word "and," as shown on the punched slip:



As printed at the other end, this reads:



The third portion of this instrument is the "receiver," in which the currents sent by the action of the punched slips in the transmitter are reproduced in the dots and dashes of the Morse code—the printing being, moreover, done with a mathematical accuracy which keying by hand cannot attain. The speed of transmission depends on the length of line and state of the atmosphere; but the movement of the clock-work, both of transmitter and receiver, is capable of adjustment to any speed below 120 words per minute.

This method of transmission is now extensively used on all long lines. By combining the automatic transmission with Bain's principle of producing marks on chemically prepared paper, an American inventor has accomplished still higher speed, the lever action of the sounder or of the pencil recorder being saved.

A system of synchronous multiplex telegraphy invented by Delany has attracted considerable attention, as it provides for the simultaneous transmission of a number of messages either all in the same direction or part in one direction and the remainder in the opposite direction. The apparatus consists of (1) a circular table of alternately insulated and grounded contacts at either end of a telegraph line, (2) a synchronized rotating arm at each end of the line driven by a phonic wheel by means of electric impulses automatically sent out over the main line in either direction, or the failure of the wheel at either end to rotate synchronously with that at the other end, and (3) transmitting and receiving instruments connecting similar contacts at each end of the main line and forming practically separate and independent lines for the simultaneous transmission of despatches over the main line in either direction. The main line is connected at both of its ends to corresponding operating instruments, and transferred from one set of instruments to another so rapidly that the operators cannot realize that the line has been disconnected from their instruments and given to others, because each of them will have the line ready for use even at the highest rate of manipulation. There will therefore be established by the use of a single line as many separate lines as there are transferences of the line from the time it is taken from the first operator and again given back to him. This system has been extended to as many as 72 separate and distinct printing circuits maintained and operated on a single connecting line wire. The best results are obtained from six divisions of the contacts in the circle which gives each operator about 36 contacts with the line per second.

Statistics.—In Great Britain the first public introduction of telegraphy was made in 1846 by the Electric and International Telegraph co. Subsequently the British and Irish Magnetic co. was established, and afterward the United Kingdom co. Besides these companies, there were the London District co., the Universal Private Telegraph co., and a large number of railway companies. In 1868 and 1869, after some agitation of the question, acts were passed transferring the property of the telegraph companies to the post-office, and giving that department a monopoly in the conduct of telegraph business within the kingdom. In 1890 the number of offices belonging to the post-office was 7352, these figures including 1679 railway telegraphic offices. It appears, however, that the railway offices only take in from the public 7 per cent. of the messages sent. The mileage of land lines in Great Britain and Ireland in charge of the postal telegraph department in 1894 was 193,960, and the submarine cables under the same department numbered 118. The latter contained 2875 nautical miles of conductors. Under the government administration the system has been very greatly extended, for which purpose alone the sum of £1,193,684 has been expended in twenty-three years. The rates of toll have also been greatly reduced, and from the standpoint of efficiency this system in Great Britain is second to none in the world. The extent of the growth of its business in twenty-one years may be shown by the fact that during its first year of government control (1870–71) the gross revenue amounted to £801,262, and for 1892 the revenue reached £2,528,423 with the rates of service greatly reduced. From a financial standpoint, however, the British telegraph system has not proved a success. It was acquired by the government at a cost of a little over £10,000,000, and for the first two or three years the results were satisfactory. Since then the expenditures have exceeded the revenues, so that at the close of twenty years (March 31, 1891) a deficit of £4,074,520 had been accumulated against the postal telegraph account. It should be added, however, that there has been a very large extension of the lines and cheapening of the service since it has come under government control.

In 1894 the total length of land lines of the world was 601,142 miles, and the total length of submarine cables with one or more cores, 153,649 nautical miles.

While each kingdom fixes its own internal tariffs and regulations, the rules for the interchange and transmission of telegraph messages between the various countries of the world are regulated by telegraph conventions agreed to at Paris, Vienna, Rome, St. Petersburg, and London (the last named being held in 1879); and all official intimations in connection with international telegraphy are issued from a central bureau in Berne, Switzerland. To the mountain republic the world is indebted, not only for the example of an excellent and cheap internal system, but for the suggestion of this central administration, where all international matters are conducted. In France and Belgium internal telegraph arrangements are complete and cheap; while the United States has for many years held a place far in advance of other countries in the ordinary every-

day use of its great telegraph organizations. Perhaps the most striking instance of telegraph enterprise is that by which the daily newspapers of San Francisco are enabled to give, by means of a line of telegraph carried over the Rocky Mountains (on the line of the Central Pacific and Union Pacific railroads), not only the news from New York, but the parliamentary news from London, the prices of all the continental exchanges, and quotations from Calcutta and China of the previous day.

TELEGRAPHS OF THE UNITED STATES.*

| YEAR. | Miles of Poles and Cables. | Miles of Wire. | Offices. | Messages. | Receipts. | Expenses. | Profits. |
|-----------|-------------------------------|-------------------|----------|------------|----------------|----------------|----------------|
| 1870..... | 54,109 | 112,191 | 3,972 | 9,157,646 | \$7,138,737.96 | \$4,910,772.42 | \$2,227,965.54 |
| 1875..... | 72,833 | 179,496 | 6,565 | 17,153,710 | 9,564,574.60 | 6,335,414.77 | 3,229,157.83 |
| 1880..... | 85,645 | 233,534 | 9,077 | 29,215,509 | 12,782,894.53 | 6,948,956.74 | 5,833,937.79 |
| 1887..... | 156,814 | 524,641 | 15,658 | 47,394,530 | 17,191,909.95 | 13,154,628.54 | 4,037,281.41 |
| 1888..... | 171,375 | 616,248 | 17,241 | 51,463,955 | 19,711,164.12 | 14,640,592.18 | 5,070,571.94 |
| 1889..... | 178,754 | 647,697 | 18,470 | 54,108,326 | 20,783,194.07 | 14,566,152.61 | 6,218,041.46 |
| 1890..... | 183,917 | 678,997 | 19,382 | 55,878,762 | 22,387,028.91 | 15,074,303.81 | 7,312,725.10 |
| 1891..... | 187,981 | 715,591 | 20,098 | 59,148,343 | 23,034,326.59 | 16,428,741.84 | 6,606,584.75 |
| 1892..... | 189,576 | 739,105 | 20,700 | 62,387,298 | 23,706,404.72 | 16,307,857.10 | 7,398,547.62 |
| 1893..... | 189,936 | 769,201 | 21,078 | 66,591,858 | 24,978,442.96 | 17,482,405.68 | 7,496,037.28 |
| 1894..... | 190,303 | 790,792 | 21,166 | 68,632,237 | 21,852,655.00 | 16,060,170.00 | 5,792,485.00 |
| 1895..... | 189,714 | 802,651 | 21,360 | 58,307,315 | 22,218,019.18 | 16,076,629.97 | 6,141,389.21 |
| 1896..... | 189,918 | 826,929 | 21,725 | 58,760,444 | 22,612,736.28 | 16,714,756.10 | 5,897,680.18 |

*These figures are for the Western Union Company's business alone. No others are obtainable.

Since the introduction of the multiplex systems the improvements in telegraphy have been generally in the direction of perfecting the details of the apparatus and methods employed without introducing any radical changes in the principle of the system. One novel method, however, of telegraphing without wires deserves some attention. Induction telegraphy, as this is called, has been operated in two different ways, namely, electrostatic induction and electromagnetic induction. The first system has been employed to communicate between moving trains or between the trains and stations on a railroad. The roofs of the cars being metal, form one condensing surface, and a wire run parallel to the tracks near the roofs of the cars forms the other. Each condensing surface is connected to the earth and are supplied with the necessary instruments and batteries. By changing the charge on one surface a corresponding impulse is induced on the other surface, the impulses being sent and received in Morse characters. Instead of the ordinary sounder a telephone receiver is used. By the use of the electromagnetic induction system it is possible to signal through considerable distance in space. The most notable results with this system were achieved by Mr. W. H. Preece, chief engineer of the British postal telegraph system, who succeeded in telegraphing through distances of three and five miles without intervening wires.

TELEGRAPHY, SUBMARINE.—From the year 1850, when a copper wire insulated with gutta-percha, submerged between Dover and Calais, continued in use for one day, the progress of submarine telegraphy has been as remarkable as that of telegraphy on *terra firma*. The Malta-Alexandria cable was laid in 1861, and continued in use till 1872, when, from repeated breakages in shallow water, its use was discarded. The core consists of a strand of seven copper wires, covered by three layers of gutta-percha; outside of this, a serving of tarred yarn; and, finally, eighteen iron wires, constituting the sheathing. This was the first long cable successfully laid (its total length, in three sections, being 1331 miles); and it was also the first properly tested under water before being laid, and carefully constructed with constant watchfulness as to its electrical and mechanical conditions. This cable was thrown out of use because the chafing it underwent in shallow water made it too expensive in maintenance. So far as construction goes, it corresponds very nearly with Sir James Anderson's typical "successful iron-covered cable." With careful testing and supervision, and with the weight of cable, etc., duly proportioned to the strain, etc., a cable forms a permanent property of much value. A new form of cable, with lead as the conductor, has been suggested. The laying of the first and second Atlantic cables in 1866, after repeated failures, is described at length under ATLANTIC TELEGRAPH. In 1869 a cable 2328 m. long was laid from Brest, France, to the island of St. Pierre, s. of Newfoundland; in 1873, one from Lisbon, Portugal, to Pernambuco, Brazil. In 1874 a third British cable was laid, from Ireland to Newfoundland, and in 1875 a fourth, from Ireland to New Hampshire. In 1877 the task of duplexing a submarine cable was accomplished by Muirhead on the Aden and Bombay cable of the Eastern Telegraph company, and the "artificial line," or balance, has been since applied successfully to other cables, including two crossing the Atlantic. In view of the enormous cost of submarine telegraphy, the attainment of a means by which the carrying capacity of a cable is nearly doubled is of vast importance. In 1877 the Marseilles-Algiers cable, belonging to the French system, was duplexed by M. Ailhaud. The *Journal Télégraphique* gave in 1877 a list of 149 cables belonging to companies, and 420 belonging to government systems, existing at that date. In point of number, Norway

stood first, with 193 cables, but the total length of these was only 233 nautical miles. The total length of the 420 government cables was 4442 nautical miles, of which Britain possessed 49, measuring 1338 miles. The longest of these (excluding cables to the continent) was to Guernsey 70, and to Shetland 63 miles. The company cables (of which 96 per cent. had their administration in London) measured 59,547 nautical miles. The longest cable was that from France to America, 2585 nautical miles, and the largest organization that of the Eastern and Eastern Extension companies, embracing 48 cables of a total length of 21,883 nautical miles, to which, since 1876, several thousand miles have been added in new routes or duplicated cables.

English companies have laid three long ocean cables in the east; and a French organization of capitalists have laid a transatlantic double line. The duplication of the lines of the Eastern telegraph company from England to Bombay was completed in 1878. A similar duplication on the part of the Eastern extension telegraph company has extended the connection from Bombay to Australia by way of Madras, to Penang in the Malay peninsula, and to the East Indian islands. In 1879 the Eastern telegraph company were engaged in laying their cable to the cape of Good Hope. An agreement was made by this company with the British government to have their line down between Durban and Zanzibar by the end of July, 1879, and to have the whole cable laid and in working order by the end of the year. In consideration of an annual subsidy of \$17,500, this company agreed to give priority to government messages, and to transmit them over the cable, which was to have a capacity of fourteen words per minute, at half the rate charged the public. The British government also stipulated for the right to take possession of the wires and offices, or to permit any of the colonies so to do, in the event of the occurrence of a war, rebellion, or any other public necessity, and to retain possession so long as this might be required, on the payment of a reasonable sum in compensation. The Cape cable is covered with a brass wrapping, to protect it against the ravages of the teredos and other injurious insects, except as to those portions laid in the deep sea, where there is no danger from these annoyances. On Nov. 16 the American end of a new French cable, which was manufactured in the workshops of the Siemens Brothers in Charlton, England, was landed at North Eastham, Mass., on Cape Cod, from the steamer *Faraday*. This cable was constructed and submerged at a more rapid rate than any other ever known, the line being completed and messages sent from continent to continent seven months after the concession had been granted to the company by the French government. At about the same time a new cable was put down between Germany and Norway, this being done at the cost of the German government. Prior to that, the only telegraphic communication between Germany and Scandinavia was by way of Denmark. The new cable was a three-wired line, extending from Romøe, an island off the coast of Sleswick, to a point near Arendal. The effect of this enterprise was to throw all telegraphic traffic between Germany and Norway, and the greater part of that with other countries, except Denmark, England, and France, over the new wires, withdrawing it from the Danish lines; this cable was made by Siemens and Halskæe of Berlin. A short cable was laid by Russia across the Caspian sea from cape Gurgian to Krasnovodsk, a distance of 150 miles. This made telegraphic connection between Tjikislar and Asterabad, and messages can be sent by way of Teheran, by the Indo-European line to Tiflis. In 1880, a sixth cable was laid between Europe and America, a seventh and eighth in 1882, and the ninth and tenth in 1884. These last two mentioned belonging to the Commercial or Mackay-Bennett co., start from Penzance, Cornwall, and are connected directly with Cape Ann, Mass., and New York city. Communication is held through these lines with Havre and with Emden in North Germany. In 1882 was completed a submarine line, 3,100 miles in length, between Lima and Vera Cruz in Mexico, crossing the Isthmus of Tehuantepec by a land line of 220 miles; it thus connects the South American Pacific coast with the United States. The employment of subterranean telegraph wires, which has gained much favor on the continent of Europe, has been specially extended in Germany. These were at first only used for short distances, but were found to work so well that they have been laid for considerable lengths, and have entirely answered their purpose. A new method of insulation employed in Philadelphia obviates the difficulties which interfere with the successful working of subterranean wires. In this the material employed is paraffine oil. The wires are first wrapped in cotton, and then as many as fifty or more of them are bound together in a tight cover of netting, the whole being then inclosed in a pipe. The pipe, when laid under-ground, is kept continually filled with the oil under pressure, being supplied from connecting reservoirs. Since 1877 there have been short lines in successful operation on this plan; one of them being laid in 35 ft. of water under the Schuylkill river.

The following table sets forth the entire system of submarine cables of the world in 1896, including those along the shores and in the bays, gulfs, and estuaries of rivers, but excepting those in lakes and the interior watercourses of continents. The list includes all cables operated by private companies, and in addition thereto under the name of each nation is given the list of cables operated by the government of that nation:

| COMPANIES. | Number of Cables. | Length of Cables in Nautical Miles. | COMPANIES. | Number of Cables. | Length of Cables in Nautical Miles. |
|---------------------------------------------------------------------------------------------|-------------------|-------------------------------------|------------------------------------------------------------------------------------------------------------------|-------------------|-------------------------------------|
| Anglo-American Telegraph Co. : | | | Brazilian Submarine Telegraph Co. : | | |
| Transatlantic System — Valentia (Ireland) to Heart's Content (Newfoundland)..... | 4 | 7,505 | Carcavellos, near Lisbon (Portugal), to Madeira, to St. Vincent (Cape Verde Island), to Pernambuco (Brazil)..... | 6 | 7,369 |
| Minon, near Brest (France), to St. Pierre-Miquelon..... | 1 | 2,718 | Central and South American Telegraph Co..... | 15 | 7,496 |
| Communication on American coasts..... | 9 | 1,963 | Cuba Submarine Telegraph Co..... | 4 | 1,048 |
| European communication..... | 1 | 101 | Direct Spanish Telegraph Co..... | 4 | 708 |
| Total..... | 15 | 12,287 | Eastern & South African Telegraph Co. Eastern Extension Australasia & China Telegraph Co..... | 13 | 8,841 |
| Commercial Cable Co. : | | | Eastern Telegraph Co. : | 27 | 17,397 |
| Transatlantic System — Waterville (Ireland) to Canso (Nova Scotia)..... | 3 | 6,888 | Anglo-Spanish-Portuguese System.. | 11 | 3,566 |
| Canso, N. S., to New York..... | 1 | 828 | System West of Malta..... | 17 | 4,603 |
| Canso, N. S., to Rockport, Mass.... | 1 | 519 | Italo-Greek System..... | 2 | 253 |
| Communication in Europe..... | 2 | 839 | Austro-Greek System..... | 1 | 503 |
| Total..... | 7 | 9,074 | Greek System..... | 12 | 699 |
| Direct United States Cable Co. : | | | Turko-Greek System..... | 4 | 578 |
| Ballinskellig's Bay (Ireland) to Halifax (Nova Scotia)..... | 1 | 2,564 | Turkish System..... | 14 | 833 |
| Halifax, N. S., to Rye Beach, N. H. | 1 | 535 | Egypto-European System..... | 4 | 2,530 |
| Total..... | 2 | 3,099 | Egyptian System..... | 1 | 155 |
| Western Union Telegraph Co. : | | | Egypto-Indian System..... | 13 | 11,805 |
| Transatlantic System — Sennen Cove, near Penzance, England, to Dover Bay, near Canso, N. S. | 2 | 5,107 | Total..... | 79 | 25,525 |
| Dover Bay, N. S., to New York.... | 2 | 1,776 | Europe and Azores Telegraph Co..... | 2 | 1,052 |
| Gulf of Mexico System..... | 8 | 459 | Great Northern Telegraph Co. : Cables in Europe and Asia..... | 24 | 6,963 |
| Total..... | 12 | 7,342 | Halifax and Bermuda Cable Co..... | 1 | 850 |
| Compagnie Française du Télégraphe de Paris à New York : | | | Indo-European Telegraph Co..... | 2 | 14 |
| Brest, France, to St. Pierre-Miq.. | 1 | 2,282 | India Rubber, Gutta Percha, and Telegraph Works Co..... | 3 | 145 |
| St. Pierre to Cape Cod, Mass..... | 1 | 828 | Mexican Telegraph Co..... | 3 | 1,527 |
| Other branch lines..... | 2 | 422 | River Plate Telegraph Co..... | 3 | 87 |
| Total..... | 4 | 3,532 | Société Française des Télégraphes Sous-Marins..... | 15 | 4,544 |
| African Direct Telegraph Co..... | 8 | 2,749 | South American Cable Co..... | 2 | 2,048 |
| Black Sea Telegraph Co..... | 1 | 337 | West African Telegraph Co..... | 12 | 3,055 |
| | | | West Coast of American Telegraph Co. | 8 | 1,964 |
| | | | Western and Brazilian Telegraph Co.. | 16 | 6,147 |
| | | | West India and Panama Telegraph Co.. | 22 | 4,554 |
| | | | Total..... | 310 | 139,754 |

CABLES OWNED BY NATIONS.

| | | | | | |
|--------------------------------|-----|-------|---------------------------------------------------------|-----|--------|
| Austria..... | 35 | 122 | Turkey..... | 23 | 344 |
| Belgium..... | 2 | 54 | Argentine Republic and Brazil..... | 34 | 92 |
| Denmark..... | 60 | 210 | Australia and New Zealand..... | 26 | 425 |
| France..... | 54 | 4,603 | Bahama Islands..... | 1 | 213 |
| Germany..... | 54 | 2,052 | British America..... | 1 | 200 |
| Great Britain and Ireland..... | 135 | 1,778 | British India (Indo-European Telegraph Department)..... | 111 | 1,955 |
| Greece..... | 47 | 453 | China..... | 2 | 164 |
| Holland..... | 20 | 61 | Cochin China and Tonguin..... | 2 | 795 |
| Italy..... | 39 | 1,063 | Japan..... | 34 | 268 |
| Norway..... | 264 | 261 | Netherlands Indies..... | 5 | 77 |
| Portugal..... | 4 | 115 | Senegal, Africa-Dakar to Gorée Island.. | 1 | 3 |
| Russia..... | 9 | 283 | | | |
| Spain..... | 15 | 1,737 | Total..... | 994 | 18,132 |
| Sweden..... | 14 | 96 | | | |
| Switzerland..... | 2 | 10 | | | |

The effect of the ocean upon cable signals is such as to make it impossible in cable telegraphy to use currents of strength corresponding to those used on land lines. The causes of this are now perfectly understood, but at the time the first cable was laid they were unknown, and the cable was destroyed because a very strong battery proportionate to the length of the cable was used. On the contrary, it is now found best to use an extremely small battery, and about as much is now used as is required to ring a call bell in a private house. The problem then became to construct an instrument for reading the signals of this weak battery at the other end of the cable. For a long time a delicately suspended magnetic needle or compass was used, and its slight motions were observed by watching a spot of light reflected from the needle upon a screen. But this left no record of the message, and it was necessary for an operator of great skill to give it the closest attention and interpret the signals. The improved apparatus now in use is known as the siphon recorder. See full-page plate, TELEGRAPH INSTRUMENTS. A delicate siphon-shaped tube (fig. 9) hangs from a trough of ink, with its end close to but not touching the moving band of telegraph tape. A fine coil of wire is delicately suspended near a stationary magnet so as to twist slightly when attracting itself to the magnet. The siphon is connected by a thread with the coil, so that the motions of the coil are imparted to it. The apparatus is so delicate, and the moving power of the coil so slight, that the siphon tube is not allowed to touch the paper, on account of the resistance to its motions

when tracing the record which would result from contact with the paper, but the record is made by fine dots of ink which are made to drop from the end of the tube by a slight but constant jarring given to the table on which the whole apparatus stands. The suspended coil is connected with the ocean cable, and every faint signal current sent over the cable enters the coil, throws out delicate lines of force which attract the coil slightly to the magnet, pulls the thread attached to the siphon, and makes a wave in the line traced on the paper. Each different undulation in the tracing signifies a corresponding letter.

The signals employed are according to Wheatstone's arrangement of the European code, in which the dash is replaced by a dot sent with a negative current, or a current of opposite polarity.

All such negative currents would draw the needle, in the case of the recording instrument, to the opposite side of the tape from that to which the positive currents would move it—that is, dots and dashes would be indicated by marks on opposite sides of a line drawn along the centre of the tape. The dots placed above the tape in the figure indicate the composition according to this system of the signals representing the first part of the alphabet. The dotted line represents the way these signals actually appear upon the receiving instrument, and give an idea of the amount of practice required to decipher in these irregular waves the original signals represented directly over them. But by close examination, a definite resemblance can be seen in each case.

The waves are not exaggerated, but are reproduced by photography from a message containing the alphabet, which was transmitted under the ocean specially for the purposes of this illustration.

TELEMACHUS, son of Odysseus (see **ULYSSES**) and Penelope (q. v.), was an infant when his father left home to join in the war against Troy, but during the latter's long absence of about 20 years, grew into manhood. At the instigation and under the guidance of Athene (Minerva), who had assumed the appearance of *Mentès* (commonly known as Mentor, Lat. "the thoughtful one"), king of the Taphians, his father's dearest friend, Telemachus set out in search of his long-lost sire, after having vainly endeavored to eject his mother's troublesome suitors from the house. Having visited Pylos and Sparta, at both of which places he was most hospitably entertained, Telemachus returned home to Ithaca, where he found his father in the guise of a beggar, living with the swineherd Eumæus. After mutual recognition, father and son proceeded to slay the suitors.—In modern times, Telemachus is known chiefly as the hero of Fénelon's (q. v.) romance, *Télémaque*, once very popular as a school-book.

TELEMETRY is the art of measuring the distance to a remote object. For this purpose many forms of telemeter have been invented. They are much used in military operations; the Boulongè telemeter tells the distance of a remote object by the sound coming from it. The artilleryman can by it know the distance which his shell reaches from the noise of the explosion. Gautier's telemeter depends upon the double reflection of a ray of light. In navigation T. is useful in making known the distance of a ship from the shore.

TELEOLOGY, the doctrine of ends, is derived from the Greek *telos*, an end, a word brought into philosophic discussion by Aristotle. The idea of an end entered into the Aristotelian conception of physical science, but more properly into ethical science or morality. All the ancient systems of morality, from Socrates downward, correctly regarded it as a *practical science*; they started with the inquiry, "What is the proper and final end of all human conduct?" and the answer given by each school was the characteristic doctrine of the school. Aristotle answered, "Happiness in a peculiar sense;" the Stoics said, "A regard to the whole universe of being;" the Epicureans, "Pleasure and the absence of pain." John Stuart Mill, in the concluding chapter of his *Logic*, entitled, "The Logic of Practice, or Art; including Morality and Polity," adopts the ancient point of view, and observes that there should be a science of ends, or a reasoned statement of the final purpose of all human action; for this science he suggests the name teleology, remarking that it corresponds to what the Germans call the practical reason. There would be comprehended under it, the art of living or happiness, taste or the beautiful, morality, and politics. See **CIVILIZATION**. The word teleology is applied to the argument from design in proof of the Deity. This is in keeping with Aristotle's employment of the word in physics.

TELEOSAURUS, a genus of fossil crocodiles, the remains of which occur in the oolitic rocks. They are found associated with marine fossils, and the peculiar modification of their skeleton seems to have specially fitted them for an aquatic life.

TELEOSTEL, the order of bony fishes, corresponding very nearly with Cuvier's division of *osseous fishes*, and comprising nearly all the common fishes. Among sub-orders are *malacopteri*, *acanthini*, *acanthopteri*, *plectognathi*, and *lophobranchii* (q. v.).

TELEPATHY (Greek, *tèle*, far off, and *pathein*, to suffer). The affection of one mind by another without communication through the ordinary channels of sensation. Its phenomena are classified in correspondence with the emotions, will, senses and intellect. There are impressions:

1. Emotional; as gladness or gloom.
2. On the motor nerves impelling to action.
3. Interpreted by the sensory centres; as a visible figure (apparition), a sound, touch, taste or smell.

4. Of abstract ideas.

Telepathy has not yet established a claim to be regarded as an exact science. The Society of Psychical Research was founded a few years ago, with headquarters at London, for the purpose of collating psychical facts and scientifically investigating psychical phenomena. It made numerous experiments both upon hypnotized and non-hypnotized patients, and in 1882 sent out circulars inviting records of unusual psychical experiences. Four years later, it published *Phantasms of the Living* a two-volume work, of which Edward Gurney, Frederic W. H. Myers, and Frank Podmon were the editors, embracing all the verified facts large and small, experimental and spontaneous, that had come under its notice, analogies between the experimental and spontaneous, and a few conservative conclusions. Of the last, the most important are (1) that "under particular conditions of excitement—the rationale of which we probably do not understand, though insensibility and the near approach of death are apparently some of the most effectual of these conditions—certain persons appear to have the faculty of communicating to other persons at a distance what is happening to them, often without any intention to do so or any consciousness of doing so on their own parts," and (2) that "certain small experimental results can be produced and that certain impressive spontaneous phenomena are shown to belong to the same class."

TELEPHONE. An instrument for transmitting sounds or speech through a wire by means of electrical vibrations corresponding to the sounds. The first instrument which bore any resemblance to the telephone was constructed in 1860 by Reis, of Frankfort, but it did not embrace the most important principle of the telephone, and would not transmit speech. The successful articulating telephone was invented by Alexander Graham Bell in 1875, and first exhibited at Salem, Mass., and at the Philadelphia Centennial Exhibition.

The crude but operative apparatus of Bell was accompanied by nearly simultaneous inventions of Gray of Chicago, Edison, and others. The instruments were rapidly improved by the same men, and by Berliner, Blake, and a number of others, the best points of each combined, and the apparatus in use now is of very simple construction. The Bell instrument consists of a pear-shaped case containing a bar magnet wound with a coil of fine wire at one end and adjusted in very close proximity to a diaphragm or thin sheet-iron plate placed crosswise at the end of the case. This diaphragm is held in place by a cap screwed to the end of the case, which is hollowed out on the under side, where it bears on the diaphragm, so that the latter is gripped only around its edge, and its center is left free to vibrate towards and from the end of the magnet. Through the center of the cap is a trumpet-shaped opening similar to the mouthpiece of a speaking-tube, for the purpose of collecting the sounds and causing them to set the diaphragm in vibration. Upon the occurrence of any sound near the mouth of the instrument this diaphragm follows the motions of the surrounding air, being set into vibrations which are exactly the same as those constituting the sound. Now, if, when at rest the diaphragm could be set into the same vibrations by any other cause, the air at the mouthpiece would receive the motions or be set into the same vibrations, and the sound would be audibly produced with perfect accuracy, giving every peculiarity of volume, pitch, and quality of the original. This is the first half of the theory of the telephone. If one of these instruments when its diaphragm is set in motion by sounds, can be made to communicate the same motions to a similar instrument by electricity, or otherwise, the same sounds will be reproduced in the other instrument by its diaphragm. This is easily demonstrated by drawing a string tight between the bottoms of two spice-boxes which will serve as diaphragms, the string being passed through holes in the center of the tin and knotted. This is an old device, known as the mechanical or string telephone, and is cheap and effective for short distances. This communication of vibrations of sound over long distances was first accomplished by electricity in 1875 with the Bell electrical telephone described. The coils around the magnets of two such instruments are connected to the terminals of a telegraph wire of any length. When, in obedience to the sound vibrations, the diaphragm of the transmitting telephone approaches its magnet, the latter becomes momentarily strengthened, and an impulse of electricity is generated by induction in the coil. This impulse is transmitted over the wire, passes through the coil around the other magnet, strengthens that magnet, and causes it to attract its diaphragm. When the diaphragm of the transmitting instrument recedes from its magnet, the latter is weakened, and an impulse of electricity in an inverse direction is generated in its coil. This impulse travels over the wire, weakens the receiving magnet, and allows its diaphragm to recede in the same manner. In this way a series of impulses of electricity corresponding exactly in power, rapidity, and shape, or quality, with the sounds generated in the transmitting telephone are sent over the line and reconverted into facsimile sounds at the other instrument.

Although the reproduction of sound with the telephone is perfect in quality, the loss of volume by the time it has reached the ear is very excessive, the loudest as well as the faintest sounds being audible only when the ear is close to the receiving telephone. It is estimated that what reaches the hearer has only one three-millionth of the power of the original sound, and all efforts to improve the telephone in this respect have been unsuccessful. The form of instrument described is known as the Bell receiver, and was the first employed. It served for transmitting as well as receiving. As a transmitter it depends upon its power of generating impulses or waves of current in obedience to the vibration of the air against its diaphragm.

For commercial use, except on a few short lines, the battery system of transmission is now employed. It consists in the use, with the instrument described as a receiver, of a

transmitter in which the necessary impulses are obtained by passing a steady flow or continuous current from a battery through an instrument which throws the current into the proper vibrations, by stopping the current at each interval between impulses. It is made by substituting for the magnet and coil behind the diaphragm a few pieces of carbon between the diaphragm and a solid support. The wires are connected to the support and the diaphragm and the battery current passes through the carbon. When the diaphragm vibrates, the carbon is slightly compressed, its resistance is reduced, and the amount of current passing to the line permitted to increase momentarily. All of the necessary impulses are transmitted in this way, and speech is reproduced with sufficient precision for business purposes. The instrument is known as the Blake transmitter, and is used in connection with the Bell receiver. The transmitter is placed in a square box, with a small magneto hand-generator for ringing the call bell at the central office. The current from the transmitter, instead of being sent directly through the line, is sent through an induction coil, and the amplified current generated therein is sent to the line. The case containing the transmitter and magneto call are now always provided with a sliding-hook upon which the receiving instrument is hung when not held to the ear. The weight of the telephone pulls down this hook and closes an electrical contact whereby all of the apparatus is disconnected from the line, and an alarm bell thrown into connection so that notice may be received when some one is wanted at the telephone.

In the telephone service of cities each instrument is connected by wire to the nearest central office. As each subscriber is liable to call for connection with any one of all the others, it is necessary to so arrange the terminals that every such connection may be accomplished. For this work a device known as the multiple switch-board has been found most successful. It consists of a large frame built in vertical divisions or panels, each panel containing an annunciator for as many of the lines from subscribers as one operator can wait upon, usually about fifty. Below this, but arranged on the same panel or section, and within reach, are a great number of pins connected to all the other subscribers, so that when one of the drops of the annunciator indicates a call from one of the fifty wires in charge of this operator, he can connect that line with the one asked for by attaching one end of a piece of flexible wire to the terminal corresponding to this annunciator drop and to the pin which leads to the other subscriber asked for. Branching connections, for the convenience of the operator, are also made to his board from all of the other wires. And the calls from the lines in other groups are attended to by other operators.

An important branch of the business known as long-distance telephony is now rapidly coming into use. By means of large conductors, improved instruments, and by the use of double lines of wire instead of earth connections, it is made practicable to hold conversations easily over distances of hundreds of miles.

The telephone is of great value for detecting very delicate electric currents, for use in rough testing work on account of its simplicity, and for a great variety of special purposes.

The following table gives the Bell Telephone company's statistics for the U. S. for four years. This company has practically a monopoly of the telephone business in this country.

| | 1893. | 1894. | 1895. | 1896. | | 1893. | 1894. | 1895. | 1896. |
|---------------------------|---------|---------|---------|---------|-------------------------|---------|---------|---------|---------|
| Exchanges..... | 812 | 838 | 867 | 927 | Miles of wire submarine | 1,336 | 1,637 | 1,856 | 2,023 |
| Branch offices..... | 539 | 571 | 572 | 686 | Total miles of wire.... | 307,791 | 353,480 | 396,674 | 459,728 |
| Miles of wire on poles.. | 201,259 | 214,676 | 232,008 | 260,324 | Total circuits..... | 201,322 | 205,891 | 212,074 | 237,537 |
| Miles of wire on build'gs | 14,980 | 16,492 | 14,525 | 12,861 | Total employes..... | 9,970 | 10,421 | 11,094 | 11,930 |
| Miles of wire underground | 90,216 | 120,675 | 148,285 | 184,515 | Total subscribers..... | 232,140 | 237,186 | 243,432 | 281,695 |

TELERADIOPHONE, an instrument for reproducing sounds at a distance through the medium of an intermittent ray of light. It is based upon the discovery that if a ray of light falls upon a piece of selenium the resistance of the selenium to the passage of electricity is temporarily decreased. If a battery is connected to a telephone through this selenium, at each flash of the light the strength of the current flowing through the telephone will increase, owing to the decrease of the resistance of the selenium. If the flashes of the ray of light be made rapid, the sounds in the telephone will be correspondingly close together, or a musical note will be produced. The transmitter is arranged to throw the light upon the selenium at each sound or signal. The sounds are thereupon reproduced in the receiver as above described. The apparatus has not as yet advanced beyond the experimental stage. See **SPECTROPHONE**.

TELESCOPE (Gr. *tele-skopos*, far seeing) consists essentially of a lens or mirror, to form, within our reach, an image of a distant object; and a microscope (q.v.), to examine this image in detail. Its invention is ascribed to various individuals living about the end of the 16th c.; but there is no doubt that Galilei (q.v.) was the first to apply it to any purpose other than the gratification of mere curiosity.

The space at our disposal will not allow of our entering into any minute details, so we propose to give: *first*, a general idea of the mode in which a telescope acts, in the course of which we shall incidentally show how the magnifying power and the brightness of the image depend on the dimensions of the various parts of the instrument; *second*, to point out the various causes of imperfection, which in all telescopes are

unavoidable, and how these are reduced to as small an amount as possible; *third*, to mention the most important of the many forms which have been devised, and the processes by which these delicate instruments are practically constructed.

When a lens is employed, as in a camera obscura, to form an image of an object, as AB in fig. 1, the distance of the image from the lens depends on the focal length of



FIG. 1.

the lens, and also on the distance of the object. Practically, with telescopes, the distance of the image from the lens is, on account of the remoteness of the object, the focal length of the lens. Also the image of any point, A , of the object lies in the prolongation of the line joining A with the center, C , of the lens. Join AC , and produce it to a , Ca being made equal to the focal length of the lens, a is the point at which the image



FIG. 2.

of A is formed. Similarly at b the image of B is formed. Thus the image is *inverted*; and, seen from C , the image and the object subtend equal angles, or look equally large. When a concave mirror forms an image, the effect is as in fig. 2, where C is now the center of the sphere of which the mirror is a portion. When the object, AB , is at a great distance, the image, ab , is *inverted*, and is formed half way between C and the mirror. As before, object and image subtend equal angles at C . In order to see these images, the eye must be placed at some such point as E in each of the figures.

So much for the formation *within our reach* of an image of a distant body. We must next show the action of a lens when employed to magnify this image. When an object, as ab in fig. 3, is placed rather nearer to a lens than its focal length, rays which pass from the object through the lens appear to have come, not from the object, but from an enlarged image as $\alpha\beta$, at a greater distance from the lens—but subtending, as before, the same angle at the center, c , of the lens. In practice, the lens is so adjusted as to form the image, $\alpha\beta$, at a distance of about 10 in. from c , in which case the eye sees it most distinctly, and the distance of ab from the lens is then (practically) the focal length of the lens.

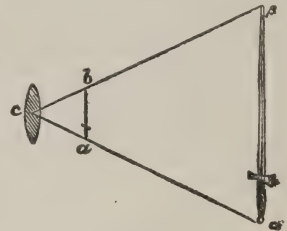


FIG. 3.

We now combine the first and third diagrams, and we have the *common astronomical telescope*. The magnifying power is obviously to be measured by the increase in the angle which is subtended by the image $\alpha\beta$ (fig. 4), over that which is subtended by the object, AB . The angle at C is the measure of the apparent size of the object; that at e , of the apparent size of the image. And it is easy to see from the quadrilateral $Caeb$ in the figure that these angles are inversely as the sides Ca and ac . (For instance, if Ca have six times the length of ac , the angle at C will be only one-sixth of that at e .) Hence the magnifying power is to be found by dividing the focal length of the object-lens by that of the eye-lens. In practice, the lenses are so mounted in tubes that their distance may be increased or diminished at pleasure. When the object, AB , comes nearer the observer, its image, ab , is formed *further* from the lens C . Hence, for near objects, the telescope requires



FIG. 4.

to be pulled out. Again, the distance of most distinct vision differs for different people, so that even when AB is at a fixed distance, short-sighted and long-sighted eyes require the eye-lens to be removed from, or advanced to, ab , so that for each eye $\alpha\beta$ may be formed at the distance at which it can be most distinctly seen.

To estimate the relative brightness of the image and object, suppose, for simplicity, all the light which enters the telescope from the object to reach the eye. Then the quantity of light which enters the eye from the image is greater than that which would enter the unaided eye from the object, in the ratio of the aperture of the object-glass, C , to the aperture of the pupil of the eye. But it is spread over a magnified image. If the image be as much larger than the object as the object-glass is larger than the pupil of the eye, the object and image will appear equally bright. Taking the aperture of the pupil as $\frac{1}{10}$ in., the object-lens would require an aperture of 10 in., with a magnifying power of 100 times, in order that brightness should not be lost. Practically, the most formidable difficulty in attaining very high magnifying powers is that due to the enormous size of lenses and mirrors which are required to give the necessary brightness to the enlarged image. It is easy to see that it is impossible to render the final image brighter than the object by any increase of dimensions in the object-lens.

After what we have said about the common astronomical telescope, the reader will have no difficulty, from a combination of figures 2 and 3, in understanding the construction of the Newtonian or Herschelian reflecting telescope.

We proceed to the second part of our proposed scheme of treatment of the subject, viz., the unavoidable imperfections of the telescope, and their reduction to a minimum.

In the first place, then, even with a mirror—where we are not annoyed by the breaking up of white light into its component colors, since the law of reflection (q.v.) is the same for all rays—it is impossible to form a perfectly sharp image of more than *one* definite point at a time. In order to do even this, the mirror must be formed as part of the prolate spheroid produced by the rotation, about its longer axis, of an ellipse (q.v.), one of whose foci is the object-point, the other the image. If the object-point be, like a star, practically at an infinite distance, the requisite form of the mirror is that formed by the rotation of a parabola (q.v.) about its axis. The axis of the mirror must then be directed to the object-point, and all rays from it will, after reflection, pass accurately through the focus. But this is not strictly true for any other object-point in the field of view, although so nearly true that no inconvenience is practically found to result from it. But, if the mirror used be part of a sphere, no point can be found such that rays diverging from it shall all be brought after reflection accurately to one point of the image; and this defect, called *spherical aberration*, increases proportionally to the surface of the mirror; so that by increasing that surface, for the attainment of brightness, we increase proportionally the indistinctness of the image. To give an idea of the delicate manipulation required in the construction of a reflecting telescope, we take the case of a speculum of 4 ft. aperture and 40 ft. focus, as calculated by sir J. Herschel. If this be first ground to a truly spherical form, it must have a radius of 80 ft., as we have seen above. Now, such a mirror will give a very indistinct image, even under the most favorable circumstances; yet to grind it to the parabolic form, which is practically perfect, leaving the middle untouched, and grinding more and more away from its surface as we proceed outward to the edges, even at the edges we have to remove a film of metal of only the $\frac{1}{1000}$ part of an inch, somewhere about the $\frac{1}{100}$ part of the thickness of the paper on which this is printed!

Lenses, whether the object-lens or the eye-lens, have this defect also; but, as a rule, the spherical aberration in lenses is almost negligible compared with *chromatic aberration*, which arises from the different refrangibilities (see REFRACTION) of the various colored rays; and leads to the formation, by a lens, of a separate image of a bright object for each colored ray. The remedy consists in *achromatizing* (see ACHROMATISM, REFRACTION) the lens—i.e., forming it of two or more lenses of different kinds of glass—so that the colors, separated by one, shall be reunited by the others. With a double achromatic lens, in which a convex lens of crown glass is united to a concave of flint-glass, the focal lengths of the separate lenses can be easily adjusted so as to bring, when in combination, any two assigned rays of the spectrum (q.v.) simultaneously to a focus; and, by a judicious selection of these two rays, we may reduce the consequences of irrationality of dispersion (see REFRACTION) to a minimum. But this is not all. To construct a lens of a given material which shall have a given focal length, is an *indeterminate* problem; we may assign the curvature of either surface at pleasure, and then that of the other is definite, and can be calculated. Thus, the achromatism of a double-lens can be secured in an infinite variety of ways, and we may impose further conditions; i.e., that the curvatures of the convex and concave surfaces shall be adjusted so as to destroy as far as possible the spherical aberration. Other imperfections, such as those due to diffraction (q.v.), etc., cannot be here more than alluded to, as they do not admit, within any reasonable limits, of being popularly explained. Nor can we enter upon questions connected with the correction of chromatic and spherical aberrations in eye-pieces, which is effected by the combination of two or more lenses (generally of the *same* material) placed at a certain distance from each other. We may only mention that the defect (for terrestrial purposes) of the common astronomical telescope, the inversion of the image, is overcome by combining two such telescopes, the smaller to examine the image formed by the larger, and therefore to reinvert it. This practically comes to constructing the eye-piece of three lenses at a distance from each other; though, for greater distinctness, four are usually employed.

In the earliest, or Galilean, telescope, the eye-lens is concave; a construction only

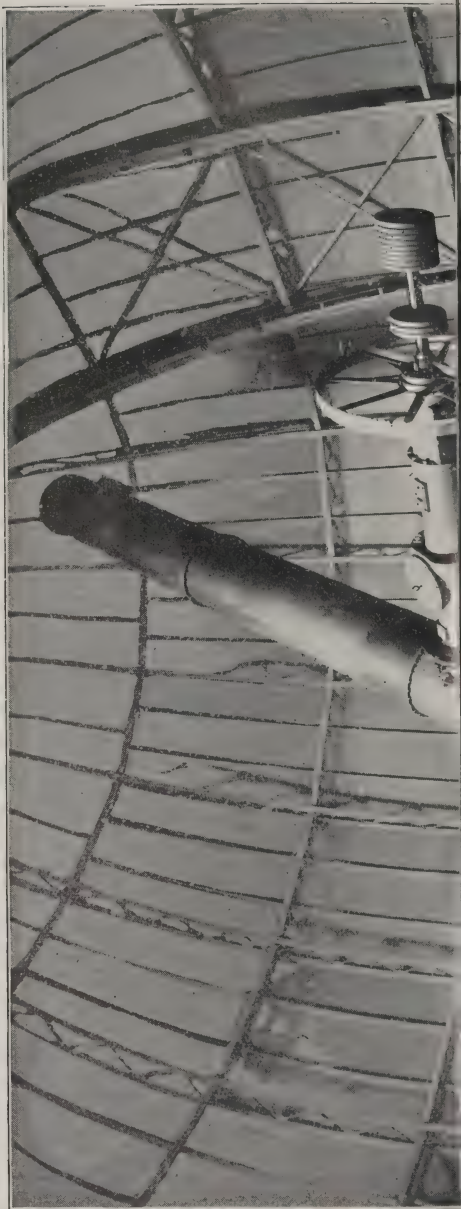
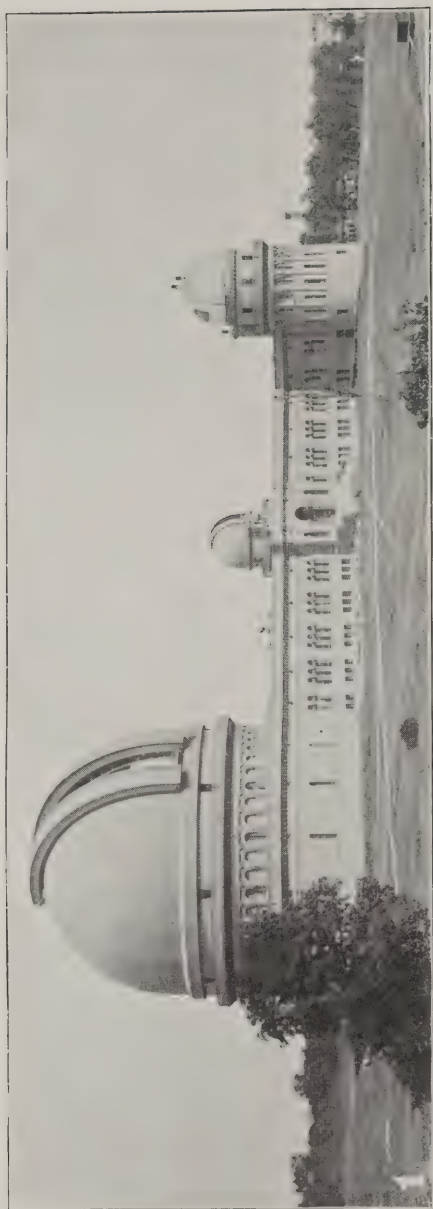
now used in opera-glasses. It has far less chromatic and spherical aberration than the common astronomical telescope, and is shorter, since the distance between the lenses is the *difference*, not the *sum* of their focal lengths; but it has a very serious defect in the smallness of its field of view. This can only be enlarged, as in opera-glasses, by making the diameter of the object-lens disproportionately great.

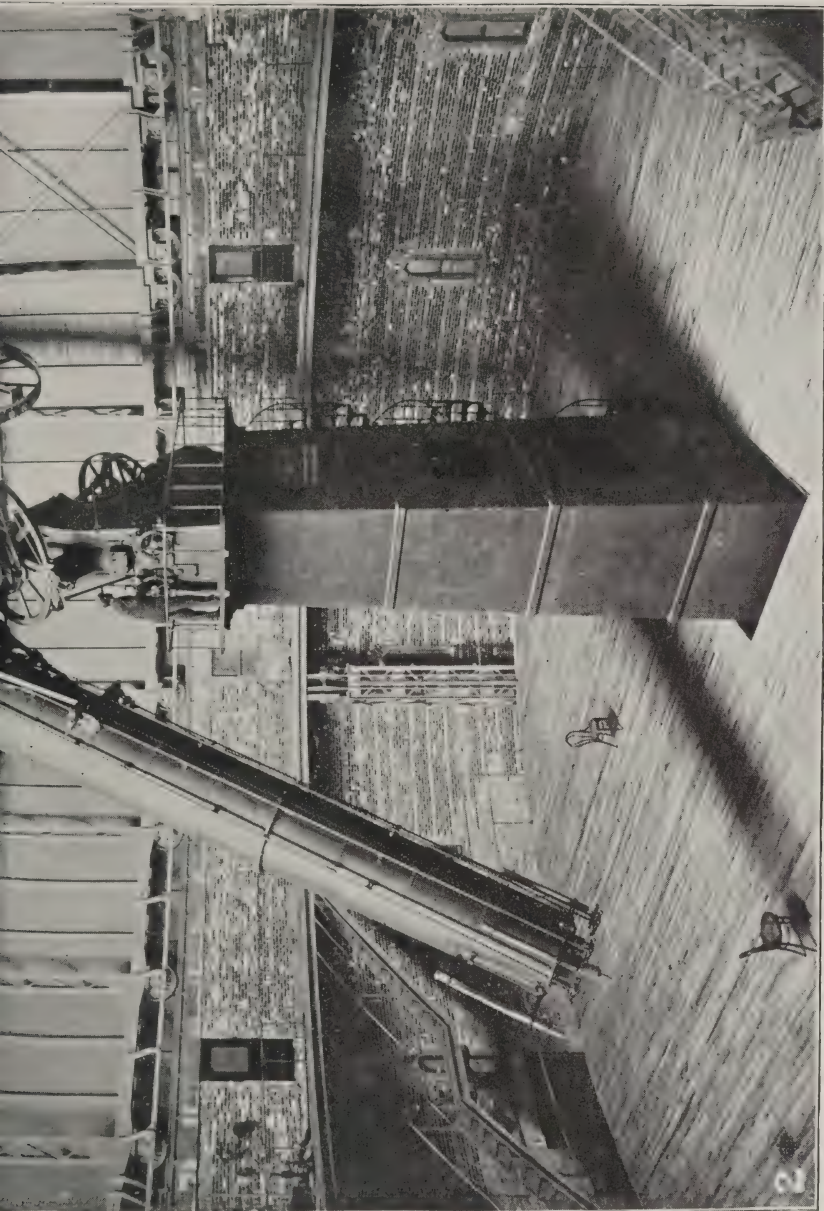
Before the discovery of the possibility of forming an achromatic lens, Huygens, Cassini, and others, had endeavored, by enormously increasing the focal length of the object-glass of the common astronomical telescope in proportion to its diameter, to get rid as far as possible of chromatic aberration. This was called the *aërial* telescope, as the object and eye-lenses were mounted separately on stands; the tube (which would have been 100, 200, or even 600 ft. long) being dispensed with. Valuable work was done with some of these telescopes, of 125 ft. focus, but the longer ones proved unmanageable. The principle involved in these constructions is, practically, the throwing the magnifying power more on the object-lens than on the eye-lens; as the image formed by the former was still so imperfect as not to bear much additional magnification; although achromatic eye-pieces could even then be made with one kind of glass. The great step required for shortening the unwieldy instrument was therefore the perfecting of the object-lens. We have already seen how this was effected. Various very ingenious improvements on achromatic combinations, even yet (we should be inclined to think) worthy the consideration of opticians, were devised by Dr. Blair. He obtained in solutions of mercury or antimony in hydrochloric acid, media, in which, while much more refractive and more dispersive than crown-glass, no irrationality of dispersion as compared with crown-glass could be detected. With these fluid lenses he was enabled to give the telescope an aperture of $\frac{1}{2}$ of its focal length without a trace of residual color. The *diolytic* telescope, invented in 1828 by Mr. Rodger, and since made by Plössl, seems to promise very well. Its object is to obtain a large aperture for the telescope with a flint-lens (the obtaining of which, in large and perfect disks, is the great difficulty) of moderate size. In this telescope the object-lens is single, and of crown-glass; having, of course, all the defects of the single lens. These are corrected, at some distance in the cone of converging rays, by the interposition of a combination of a pair of much smaller lenses, whose focal lengths are equal for red rays; the first being a convex lens of crown, the second a concave of flint glass. The adjustments of this instrument for exact correction are, a motion of the pair of lenses to or from the object-lens, to correct chromatic aberration; and a change of the distance between the two smaller lenses, to correct spherical aberration.

Chromatic being so much more serious than spherical aberration, it is not to be wondered at that the idea of substituting an object-mirror, in which the former is absent, for an object-lens, was early suggested. The first practicable scheme for the purpose seems to have been that of Gregory; in which, however, two mirrors are employed. In the skillful hands of Short, this instrument completely superseded the ordinary astronomical telescope. Its chief defects are, the great loss of light by two direct reflections, and the increase of the spherical aberration by the fact that both mirrors are concave. The first defect is incurable, the second was partially overcome by Cassegrain's plan of using a small *convex* mirror for the second reflection. To Newton is due the simple idea of using the combination of a single curved mirror with a plane mirror and an eye-piece; a construction differing only in slight particulars from that now universally adopted for reflecting instruments. Newton constructed several such telescopes with his own hands, some of which are still preserved, as in the apartments of the royal society at Burlington House.

The process of Liebig for depositing on glass an exceedingly thin film of silver, which, by careful polishing, can be rendered more highly reflective than any other material, has been taken advantage of by Steinheil in the construction of large specula. This is an immense step, since any disk of glass will do, its optical properties not being employed; while, if it be once brought to a true parabolic figure, the silvering may be renewed as often as may be required. One of the great difficulties in the construction and working of large reflectors has hitherto been the casting and annealing of metallic masses of a few tons' weight. This, in the silvered specula, is entirely avoided. We cannot here enter into a description of the processes, often extremely ingenious, which have been devised for the grinding, figuring, and polishing of lenses and specula. Nearly all the recent telescopes are refractors; a notable one is that in the Lick observatory, Cal., having an aperture of 36 in.; among the other large ones are that of Poltava, Russia, lately made by the Clarks of Cambridge, Mass., object glass 76 centimetres; Nice, also 76; Paris, 73.5; Vienna, 68.5; Washington, 66; and the McCormick telescope, 66. A reflecting telescope of importance is that of Common, erected at Ealing, Eng.; it has a silver-on-glass reflector of $37\frac{1}{2}$ in. diam., and has proved to be a very powerful instrument. The largest refracting telescope in the world was presented by Charles T. Yerkes to the Chicago university. The lens is 40 inches, the steel tube 64 ft. long, and the column on which it rests 43 feet in height. The dome in which it stands is 90 feet in diameter, and 60 ft. high (see illustration). The dome revolves by machinery to keep pace with the motion of the earth, so that the telescope may point to any particular star all night. The floor may be raised and lowered so as to keep the observer's eye level with the glass. All the adjustments are made automatically by electricity.

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TELESCOPE (YERKES OBSERVATORY).

(1) The façade of the Yerkes Observatory. (2) Inside the great dome and view of the Telescope.

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TELESEME, an instrument for automatically telegraphing either of a number of words that are printed on its dial, by merely setting the pointer to the required word. An important feature is that, after being set, it remains locked and does not transmit its signals until the wire is entirely free from other messages. This is called the latent signal, and was invented by Dr. F. Benedict Herzog.

TELETHERMOMETER or **TELEMETER**. See **TELEMETRY**.

TELFAIR, a co. in s. Georgia, drained and bounded by the Ocmulgee and Little Ocmulgee rivers; traversed by the Savannah, Americus, and Montgomery, and the Southern railroads; 491 sq. m.; pop. '90, 5477. Co. seat, McRae.

TELFORD, THOMAS, an eminent engineer, was b. in the parish of Westerkirk, in Eskdale, Dumfriesshire, Aug. 9, 1757. His father was a shepherd; and during the intervals of his attendance at school, young Telford followed the same occupation, diligently employing his leisure moments in the perusal of whatever books were within his reach. At the age of 14, he adopted the trade of a stone-mason; and long years afterward, when he had attained the summit of his profession, he confessed the advantages which he derived during this period from "the necessity of making himself acquainted with every detail in the procuring, preparing, and employing of every kind of material, whether it be the produce of the forest, the quarry, or the forge." In 1780 he removed to Edinburgh, and in 1783, he repaired to London, obtaining employment under sir William Chambers, who was then engaged on his chief work, the erection of Somerset house. Telford's merits attracted the notice of his employer, and he was appointed in 1784 to superintend the erection of the resident commissioner's house at Portsmouth dockyard, a work which lasted over three years, and afforded Telford the opportunity, of which he fully availed himself, of mastering the details of construction of docks, wharf-walls, etc. In 1787, he was appointed surveyor of public works for Shropshire; and his two bridges over the Severn at Montford (3½ m. w.n.w. of Shrewsbury) and Buildwas (1½ m. w. of Coalbrook Dale), a large number of minor bridges, and other county works, testified to the genius and industry of the rising engineer, and gained for him the planning and superintendence of the projected Ellesmere canal, 103 m. in length, to connect the navigation of the Severn, Dee, and Mersey—a work which occupied 10 years (1795–1805), and greatly added to the already eminent reputation of Telford. In 1790 he was appointed by the British fishery society to inspect the harbors at their various stations, and in 1801 he received a commission from government to report on the state of Scotland, and on the desirable public works for that country. As a consequence, the plan of a canal from Inverness to Fort-William was revived, and its planning and construction intrusted to Telford (see **CALEDONIAN CANAL**). In the same capacity of engineer to the parliamentary commission of roads and bridges for Scotland, he executed more than 1000 m. of road in the Highlands, Lanarkshire, and Dumfriesshire (see **ROADS**), and erected about 1200 bridges, besides churches, manse, harbors, etc. In 1808, and again in 1813, he was invited to Sweden, to report on the projected scheme for connecting lake Wener with the Baltic, and superintended the construction of the Gotha canal, by which this was effected; receiving on his departure numerous and valuable marks of the royal approbation. His next great work was the construction of the road from London to Holyhead, including the erection of numerous bridges—among others, of the Menai *suspension bridge* (q.v.)—and the last was the execution of the St. Katharine's docks in London, a work of remarkable merit. His other works are far too many to enumerate. We can only afford to state that, of bridges, the Conway (q.v.), the Broomielaw at Glasgow, the Dean in Edinburgh, the Over at Gloucester (an innovation on the ordinary form); of canals, the Glasgow and Paisley, the Macclesfield, the Birmingham and Liverpool junction, the Gloucester and Berkeley, the Weaver system, the great tunnel (1½ m. long) on the Trent and Mersey; of harbors, Peterhead, Banff, Fraserburgh, Fortrose, Cullen, and Kirkwall—were planned by this indefatigable genius, and wholly or partially erected under his superintendence. He was much employed by parliament to report on all public engineering schemes or works of importance, and was also occasionally consulted by the Russian government. For the last few years of his life, he retired from the active duties of his profession, employed himself in collecting and arranging materials for a complete history of his various works, and had the greater portion of the MSS. ready when he was seized with a severe bilious attack, and died at Abingdon street, Westminster, Sept. 2, 1834. His life, entitled *The Life of Thomas Telford, Civil Engineer, written by himself*, was published in 1838, in 1 vol. 4to, accompanied with a companion volume of plates.

TELL, a district in the extreme n.w. of Africa, stretches along the shores of the Mediterranean, and comprehends the corn-growing tracts extending s. from the Mediterranean to the Atlas mountains, and from w. to e. through Morocco, Algeria, and Tunis. The Tell is noticed under the articles Africa and Sahara (q.v.).

TELL, WILLIAM, was, according to Swiss tradition, a patriot who, in the 14th c., rescued his native district from the tyranny of the house of Austria. His story has been variously told, but that version which has found the widest currency is the following. In the beginning of the 14th c., Albert I. of Austria was striving to annex the three Waldstädte, Uri, Schwyz, and Unterwalden, to his family estates. Hermann Gessler, his bailiff (or *Landvogt*), lived at the castle of Küssnacht, and perpetrated on the people of the dis-

friest the most atrocious cruelties. A league was formed of the principal men of the Waldstätte to resist the Austrian pretensions, and to it belonged Walter Fürst, and William Tell, his son-in-law. Among other acts of tyranny, Gessler placed the ducal hat of Austria on the top of a long pole, erected in the market-place of Altorf, and gave orders that no one should pass without uncovering his head. Tell and his little boy one day took no notice of the hat, and were at once dragged before Gessler. He, hearing that Tell enjoyed great reputation as a cross-bowman, resolved to make his skill a means of punishing him. He was ordered to shoot an apple from his son's head, and told that if he missed it, he should die. To the amazement of all present, he hit the apple without injuring the child. But this did not satisfy Gessler. Turning to Tell, he asked him what he meant to have done with a second arrow he had in his girdle. "To have shot you if it had slain my son," was the reply. Tell was then seized, bound, and thrown into a boat on the lake of Lucerne, to be taken with Gessler and his men to the castle of Küssnacht. A sudden Alpine storm sprung up. Tell was the only man on board who knew the shore, and could manage a boat in such weather. He was allowed to take the helm, and he soon ran her toward a rocky ledge; he there seized his bow and arrows, sprang on shore, and pushed the vessel back into the water. The storm, however, abated, and Gessler and his party landed. Tell lay in wait for them in a rocky defile, and as they passed, he shot Gessler through the heart. This befell in 1307, and was followed by the great Swiss war with Austria—the first of a series which lasted till 1499—in which, however, Tell took no prominent part. Tell was drowned, it is added, in 1350, in attempting to save a friend during a great flood of the river Schächen.

There is evidence that, in 1387, a religious service was instituted to commemorate the act of Tell at the place where he lived; and that, in the following year, Tell's chapel was built on the spot where the boat was said to have landed. Russ and Etterlin, chroniclers who lived toward the end of the 15th c., told his story as true history. Tschudi, who wrote in the first part of the 16th c., repeated it in the form in which it is now familiar to us, and in which it was adopted by Schiller, in his well-known drama. So early as the end of the 16th c., however, doubts were expressed of its authenticity. Guilmann, who wrote a book, *De Rebus Helveticis*, called in question the very existence of Tell. What, he asks, has become of his family and relatives? Why was he not spoken of by his contemporaries? Grasser, the author of a Swiss *Heldenbuch*, pointed out a striking resemblance between Tell and Toke, the hero of an old Scandinavian fable, recorded by Saxo Grammaticus. From that period, incredulity became general, and several books were published to show that the story was legendary. One of these, *Guillaume Tell; fable danoise*, was burned by the public hangman at Uri, and then a patriotic feeling was manifested on the subject, which, it is believed, made Swiss writers, including J. von Müller the historian, cautious in expressing farther doubt. Voltaire, in speaking of Tell, makes the remark, that "*l'histoire de la pomme est bien suspecte*," and asserts that no part of the tale had a foundation in fact. His opinion became known all over Europe; and since then, a whole library has been published on the story of Tell, in Switzerland, Germany, Denmark, and France. The most important works, however, bearing on the question, are (1) Ideler's work, *Die Sage vom Scheusse des Tell*, published at Berlin in 1826, in which it is shown that the incident of the apple is purely legendary; (2) an edition of Russ's chronicle, edited in 1834, by M. Schneller of Lucerne, in which it is proved that serious disparities exist between the different versions of the story as told by the Swiss chroniclers; and (3) a work containing a series of documents relating to early Swiss history, published in 1835 by M. Kopp, also of Lucerne, in which it is as satisfactorily shown that, although a continuous series of charters exist relative to the bailiffs of Küssnacht in the 14th c., there is no Gessler among them. Tell is nowhere mentioned in contemporary records; but it need not, therefore, be inferred that an obscure peasant did not exist of the name, who shot an Austrian bailiff on the banks of the lake of Lucerne, who by this act caused a revolt, and who lost his life in attempting to save that of a friend. If such incidents really occurred—and from the early foundation of Tell's chapel, and other facts connected with it, we must presume they did—it would be easy to explain how they became connected with the old fable of the tyrant, the bowman, and the apple.—Ample information on the Tell controversy will be found in Hisely's *Recherches* (1843); and Vischer's *Die Sage von der Befreiung der Waldstätte* (1867).

TELLER, HENRY M., b. Allegany co., N. Y., 1830; graduated at Allegany univ.; was admitted to the bar, 1858, and removed to Ill. He settled in Colorado, 1861, and was chosen the first U. S. senator from the new state, 1876. In the senate he was noted as an advocate of the unlimited coinage of silver. He was sec. of the interior, 1882-85, under Pres. Arthur; U. S. senator from Colorado, 1885 and 1891.

TELLEZ, GABRIEL, better known by his literary pseudonym of *Tirso de Molina*, a Spanish dramatist of great reputation, was b. at Madrid in 1585, became a monk in 1620, and died in 1648, prior of the order to which he belonged. Tellez was a friend and pupil of Lope de Vega, whom he almost rivaled in facility of execution. In the preface to his *Cigarrales de Toledo* (1621), a collection of novels and comedies, he reckons the number of the latter composed by him at 300; of which, however, only 68 have come down to us. Besides these, he wrote several interludes, a great number of *Autos Sacramentales*, an *Acto de Contrición en Verso*, and a *Genealogía de los Condes de Sástago* (Mad. 1640). Tellez ranks next to Calderon and Lope de Vega as a dramatist. Although he generously affected to consider himself only a follower of the latter, he is really one

of the most decisively original geniuses of his country, and imitated Lope in nothing except in cultivating the same national spirit in literature. His plays, deficient in artistic conception, are full of dramatic vitality. The "situations" are numerous and captivating, the delineation of character fresh, piquant and vigorous; the wit abundant, and the language richly poetical.—The best edition of Teller's works is that of Don Juan Eugenio Hartzenbusch, in the *Teatro Escogido* (12 vols., Madrid, 1839-42).

TELLICHERY, a sea-port t. and military station of British India, in the district of Malabar, Madras. It is situated on the open sea, in a beautiful and fertile district, the low lands producing two, and in some cases three, crops of rice in the year. Spices and sandal-wood are exported. Pop. '91, 27,196.

TELLINIDÆ, a family of lamellibranchiate mollusks; having the mantle widely open in front; the foot tongue-shaped; the siphons separate, long, and slender; the shell usually equivalve and shutting close, the hinge toothed. The species are very numerous, and are found in almost all seas, mostly living in sand or sandy mud, some of them at a considerable depth. The fossil species are also numerous, and are found in the more recent formations. The genus *donax* belongs to this family.

TELLURIUM (symb. *Te*, equiv. 64—new system, 125—spec. grav. 6.24) is a chemical element, which some authorities place among the metals, and others among the non-metallic bodies or metalloids. Although in its outward characters it closely resembles the metals, its close analogies with sulphur and selenium indicate that its true place is among the metalloids. It possesses a high metallic lustre, and resembles bismuth in color; it fuses at about 932° F. (500° C.), and at a higher temperature is converted into a yellow vapor; it is a bad conductor of heat and electricity. When strongly heated in the air it burns with a blue flame, and gives off white fumes of tellurium dioxide. Like sulphur and selenium, it is soluble in cold oil of vitriol, to which it gives a fine purple-red color, and on dilution it is precipitated unchanged; and in these respects differs from all metals. In nitric acid it dissolves with oxidation.

Tellurium forms two compounds with oxygen, viz., *tellurium dioxide*, TeO_2 , and *tellurium trioxide*, TeO_3 . These have corresponding hydrates; *tellurous acid*, H_2TeO_3 , and *telluric acid*, H_2TeO_4 , which are parallel with sulphurous and sulphuric acids. *Tellurous acid* exhibits very slight acid properties, and in the anhydrous state it even combines with acids, and acts the part of a weak base. These salts have a metallic taste, and are said to act powerfully as emetics. The *telluric acid* has only a feeble affinity for bases, but it forms salts, which contain 1, 2, and 4 molecules of the acid to each molecule of base. Tellurium unites with hydrogen to form tellureted hydrogen, TeH_2 , which is a gaseous body, analogous to hydrogen sulphide, and precipitates most of the metals from their solutions in the form of tellurides, which have a close analogy with the corresponding sulphides.

In experimenting upon the action of the salts of tellurium, it has been found that they possess the power of forming, in the body of a healthy person, compounds which impart to the breath, to the perspiration, and to the gases generated in the intestinal canal, a disgusting fetor, which makes him a nuisance to every one he approaches.

Tellurium is a rare substance, found chiefly in Transylvania, but recently discovered in Hungary, in North America, and in the Altai silver mines. It sometimes occurs native, but more commonly as a telluride of gold, lead, or silver. For the method of extracting it, we must refer to any of the larger works on chemistry, and especially to the *Lehrbuch* of Berzelius. It was discovered in 1782 by Müller von Reichenstein, but it was not till 1798 that its properties were accurately studied by Klaproth. The word tellurium is derived from the Latin *tellus*, the earth.

TELPERAGE, a system of aerial transportation devised by Prof. Fleeming Jenkin, and designed primarily for the transportation of freight. A light wire rope or steel rod serves as the conducting rail, and is strung between poles at such a height that the carriages or buckets, called "skips," cannot possibly touch the ground in their passage. A train is composed of several carriages headed by an electro-motor, in a separate frame. Several systems are in use. In that of Ayrton and Perry, self-governing motors, weighing only 96 lbs., are used. Saddles curved in a vertical plane are placed at the extremities of the cross-arms of the supporting posts, and to these the wires or cables are attached. By one method of construction, called the "series" system, the line is divided into successive sections, and the train as it moves by, breaks the electric connection between them, this being restored automatically as the train passes on. Experiments with a line at Weston, England, arranged on the multiple arc system, led to the conclusion that, working 20 hours a day, a train could transport 1850 tons a m. It was found that the carriages ran smoothly, that the grip of the locomotive was entirely satisfactory, and that there was no difficulty in insulation even with high-tension currents. It will be seen that for the transportation of freight, of ores, coal, etc., telpherage affords a cheap and comparatively easy method.

TEMBU (Abatembu, or Tambookie) is the name of an important tribe of Kaffirs, occupying the region e. of the present boundary of the Cape Colony, where it forms the eastern limit of the district of Queenstown, formed by sir Harry Smith in 1849-50, a rather elevated plateau, from which flow the head-waters of the Kéi, Bashee, Tsomo, and other important rivers. They number about 90,000 souls.

TEMES, a co. in s.e. Hungary, in the trans-Tibiscan circle; 2741 sq. m.; pop. '90, 434,529. It is drained by the Berzava, Temes, Krassó, and Nera rivers. The soil is very fertile, producing wheat, corn, hemp, flax, fruit, cotton, and grapes, from which much wine is made. The silkworm is raised, and great numbers of cattle. Capital, Temesvár.

TEMESVÁR, a city in Hungary, the seat of a Roman Catholic and Greek bishop, situated in a plain on the Bega canal, 188 miles s.e. of Budapest. The town is strongly fortified, and has handsome streets and large public squares, two cathedrals, an ancient castle, built by Hunyady in 1442, a palace of the Greek Catholic bishop, an armory, barracks, and a theater. Temesvár has important manufactories of cloth, paper, leather, wool, soda, oil, machinery, etc., royal tobacco works and a large brewery. There is also important trade in grain and wood. Temesvár was founded in the 13th century, was afterwards a strong fortress, and played a prominent part in the Turkish wars. It has often been besieged, most recently in 1849, when it was bombarded 107 days by the Hungarian insurgents, and partly destroyed, when it was relieved by Marshal Haynau. Pop. (a mixture of Germans, Magyars, and Roumanians), '90, 39,884.

TEMISCOUATA, a co. in s.e. Quebec, Canada, bordered n. by the St. Lawrence river, and s. by New Brunswick and Maine; 1770 sq. m.; pop. '91, 25,698. The surface is mountainous. Co. seat, Isle Vert.

TEMPÉ, a narrow valley or gorge, about 6 m. long, in the n.e. of Thessaly, between Olympus (q.v.) and Ossa (q.v.), through which flows the river Peneus. The classic poets (none of whom, curious to say, appear to have ever seen the glen) praise it for its matchless beauty, and hence the name with them became a synonym for any lovely vale. In point of fact, however, the scenery of Tempé is characterized by wild grandeur rather than by soft sylvan charms.

TEMPERA, in painting, the same as *distemper* (q.v.).

TEMPERAMENT is a term which has been employed in physiology ever since the time of Galen, to designate the certain physical and mental characteristics presented by different individuals. Dr. Todd, in his article on this subject in the *Cyclopædia of Anatomy and Physiology*, observes that "the temperaments the existence of which seems most consistent with observation, are those admitted by Cullen, namely, the *sanguineous* and the *melancholic*, the *phlegmatic* being a degree or modification of the sanguineous, and the *choleric* of the melancholic."

Individuals of the *sanguineous* or *sanguine* temperament are such, according to Cullen, as have the quantity of fluids in the body large in proportion to the solids; the habit of body soft and plump; the skin smooth, white, and readily sweating on exercise; the hair soft, and generally pale, passing from thence to a red tint; the complexion ruddy; the eyes blue; the bodily strength moderate; and the mind sensible, irritable, cheerful, and unsteady. In persons of the *melancholic* temperament, the habit of the body is somewhat hard and meager; the skin and complexion coarse, and of a dun color; the hair hard, curly, and black; the strength considerable; the mind slow, disposed to gravity, caution, and timidity, but tenacious and steady.

Some writers recognize a *nervous* temperament, in which the predominating characteristic is a great excitability of the nervous system, and an undue predominance of the emotional impulses. This temperament is always associated with the sanguineous or the melancholic. In both sexes, the characteristics of the temperaments are far less manifest in old age than in earlier life. If it be admitted, as Dr. Todd believes, that a constant connection exists between color and temperament, it obviously follows that the nature of the temperament is determined by certain peculiarities in the physical condition of the organism. The different temperaments often merge so gradually into one another that it is in many cases difficult to decide positively to which variety any special case belongs.

TEMPERAMENT, in music, a system of compromise in keyed instruments for the avoidance of the necessity presupposed by the strict relation of musical intervals of having a separate row of keys corresponding to each tonic. Taking C as keynote, the ratios of the notes of the diatonic scale, as derived from the number of vibrations in a given time of a string sounding that note (see *MUSIC*), are:

| | | | | | | | |
|----|----|----|----|----|----|----|----|
| C | D | E | F | G | A | B | C |
| 24 | 27 | 30 | 32 | 36 | 40 | 45 | 48 |

The intervals between these notes are by no means equal, and may be thus expressed in numbers by logarithms:

| | | | | | | | |
|----|----|----|----|----|----|----|---|
| C | D | E | F | G | A | B | C |
| 51 | 46 | 28 | 51 | 46 | 51 | 28 | |

We have here three species of intervals, of which those represented by 51 are called major tones; those by 46, minor tones; and the smaller intervals represented by 28, semitones. These intervals will evidently only serve with C as keynote. If, for example, we start from D instead of C, we find E a tolerable, though not quite correct, second to D: but the third and seventh of the scale are entirely wrong. Were the major and minor

tones equal, and each semitone exactly half a tone, the insertion of a note in the middle of each tone dividing the seven intervals would make it immaterial where the scale began; any one of the twelve notes becoming alike available as a keynote; and though such equality is contrary to the immutable principles of harmony, an arrangement based on it is found practically to give but little offense to the ear. In what is called the *equal temperament*, the twelve intervals are all of the same length, and no advantage is given to one key over the rest. This is, in theory at least, the temperament adopted in the pianoforte. Another system, known in this country as *Smith's* or the *vulgar temperament*, in which some keys were favored at the expense of others, has been much used in organs. While the keys of B \flat , F, C, G, D, and A are more perfect than on equally tempered instruments B \flat , A \flat , D \flat , and F \sharp contain some very harsh intervals. The bad fifths and thirds which exist in these keys are designated by musicians by the name of *wolf* intervals. This mode of tuning the organ is being more and more abandoned for the equal temperament, or an approximation to it. The different characters of the various keys often observed on the pianoforte, as well as the organ, could have no existence were the temperament absolutely equal, and arise out of the circumstance that this strict equality is not altogether adhered to in practice.

TEMPERANCE, a magisterial dist., Amherst co., Va. Pop. '90, 3635.

TEMPERANCE. *History of the Movement.*—The origin of the temperance movement dates from the beginning of the present century; and the merit of having taken the first steps in the matter belongs to America, where the vice of drunkenness appears to have reached an alarming height about that time. In the month of April, 1808, a society was established at Moreau, county of Saratoga, in the state of New York, consisting of 43 members; one of whose rules was as follows: "Art. 4. No member shall drink rum, gin, whisky, wine, or any distilled spirits, or compositions of the same, or any of them, except by the advice of a physician, or in case of actual disease (*also excepting at public dinners*), under the penalty of 25 cents, provided that this article shall not infringe on any religious rite." This society had other rules prohibiting members (under penalties) from offering any of the above liquors, or from being intoxicated; but though it continued to exist for 14 years, it does not seem to have accomplished much good. Gradually, however, the attention of the clergy and of philanthropical laymen was called to the subject; and after a series of sermons had been preached and published against a vice whose rapid progress was threatening (according to Dr. B. J. Clarke) to make the Americans "a community of drunkards," a society was started at Boston (Feb., 1826), called The American Temperance Society, "to restrain and prevent the intemperate use of intoxicating liquors." In 1829, The New York State Temperance Society was formed; and before the close of the year, 1000 local societies, with 100,000 members, were in existence, and a periodical entitled *The Journal of Humanity*, established to promote the new movement. Rumors of the progress of temperance societies soon reached the old world, and in Aug., 1829, a society was started at New Ross, in the county of Wexford, Ireland, under the auspices of the Rev. George Whitmore Carr, the members of which pledged themselves "to abstain from the use of distilled spirits, except as a medicine in the case of bodily ailment;" and further, "neither to allow the use of them in their families, nor to provide them for the entertainment of friends." Simultaneously, a movement in favor of temperance was begun in Belfast and the north of Ireland, by the Rev. Dr. Edgar, Rev. Dr. Cook, and Rev. Mr. Morgan, and before 12 months were over, 60 societies had been constituted, numbering about 3500 members, both Catholics and Protestants. Meanwhile, Scotland had not been uninfluenced. As early as Oct., 1829, Mr. John Dunlop, of Greenock, a justice of peace for Renfrewshire, after lecturing on the subject of temperance in Glasgow, Sterling, and elsewhere, succeeded in forming a society at Greenock, the first in Scotland, and the precursor of The Glasgow and West of Scotland Temperance Society, formed in the ensuing November. Mr. Dunlop is thus entitled to be considered "the father of temperance societies in Great Britain." In his early labors, he was greatly assisted by Mr. William Collins of Glasgow, who became the editor and publisher of the *Temperance Record* (1830-35). The rules of The Glasgow and West of Scotland Temperance Society were substantially the same as those of the American and Irish societies—the members voluntarily agreeing "to relinquish entirely the use of ardent spirits, except for medicinal purposes," although "the moderate use of other liquors is not excluded." The zeal and activity of this society were remarkable. According to the report read at the first annual meeting (Dec. 30, 1830), it had circulated in the course of the year 425,300 tracts and 20,200 pamphlets, and numbered in Glasgow alone 5,072 adherents; while it was stated that throughout Scotland at large there were 130 societies, and 25,478 members. It is not necessary to follow further in detail the course of the temperance movement, *strictly so called*, in Scotland, except to remark, that numbers of the clergy now began to interest themselves in it, and at the close of 1831, there were 187 ministers of various denominations in Scotland connected with the cause; but we must now notice the introduction of a new and more stringent application of the temperance principle. On Sept. 21, 1830, Mr. John Davie, and several other members of the temperance society of Dunfermline, pledged themselves to "total abstinence from all intoxicating liquors—small-beer excepted, and wine on sacramental occasions;" and in the course of the next two years, "total abstinence societies" were started in Glasgow, Paisley, and other places. In 1830, the temperance movement

extended to England. Mr. Henry Forbes, a merchant of Bradford in Yorkshire, happening to be in Glasgow on business, had attended one of the meetings of the Glasgow society, became deeply interested, and on his return home took steps to organize a Bradford society (Feb. 2, 1830). Another society was formed at Warrington (April 4, 1830); a third at Manchester (May 12, 1830); and by the close of the year, about 30 temperance societies were in existence, numbering in all 10,000 members. In June, 1831, The British and Foreign Temperance Society was organized in London, mainly through the persevering efforts of Mr. William Collins of Glasgow. This was for many years the leading society of the party, its patron being the bishop of London, and its vice-presidents including several other prelates, distinguished officials both civil and military, and a few members of parliament. The pledge taken by its members was simple: "We agree to abstain from distilled spirits, except for medicinal purposes, and to discountenance the causes and practice of intemperance." We have not space to narrate its history and progress in detail, but we may notice that it was instrumental in awakening an interest in the temperance movement both in the army and navy, and that, in the course of a single year (1831-32), it could boast of having induced 400 old Greenwich pensioners to give up their grog.

Gradually, however, the more fervid friends of temperance in England arrived at the same conclusion as the Dunfermline "reformers"—viz., that a crusade against gin and other "alcoholic" liquors was not enough; that "beer" was the great cause of drunkenness in their country, and that nothing but total abstinence from all intoxicating drinks would cure the evil. The movement in this direction first took shape at Preston in Lancashire, in Sept., 1832, when Mr. Joseph Livesey, and some other members of the temperance society there, pledged themselves "to abstain from all liquors of an intoxicating quality, whether ale, porter, wine, or ardent spirits, except as medicines." An active propagandism in all the principal towns of Lancashire followed, and a considerable number of adherents were gained to the new cause. In Sept., 1833, according to the commonly received story (see Burne's *Teetotaler's Companion*, p. 333), the notable word *teetotal* was first used. A certain Richard Turner, or, as he was more generally called, "Dicky Turner," a plasterer's laborer or *lime-larry*, who was much given to holding forth in the Lancashire dialect at the meetings of the new sect, happened in the course of a philippic against temperance to say: "I'll hev nowt to do wi' this moderation—*botheration*—pledge; I'll be reet down tee-tee-total for ever and ever." "Well done, Dicky!" said Mr. Livesey: "that shall be the name of our new pledge." This origin of the word, which appears to make it but a stuttering pronunciation of *total*, has, however, been disputed; and it is affirmed that the term is simply a Lancashire phrase for final, thorough, or complete; thus, when a man is discharged merely for want of work, he is said to be *sacked*, but when discharged from inability to work, *teetotally sacked*. Whatever may have been the origin of the term, the new sect was resolved to be "thorough." In April, 1834, a Youths' Temperance Society, on strictly teetotal principles, was formed at Preston; and before a year had passed it reckoned nearly 1000 members. By dint of zeal, respectable teetotal societies were also established at Manchester (Aug., 1834), Lancaster (Nov., 1834), Colne (Dec., 1834), Isle of Man (Dec., 1835), and numerous other places. Meanwhile (Sept., 1835), a conference of Lancashire and Yorkshire delegates was held at Manchester, and a new general society formed under the title of The British Association for the Promotion of Temperance on the Principle of Total Abstinence from all Intoxicating Liquors. This title clearly indicated the ambitious views of the new sect. It wished, and it hoped erelong, to speak in the name of the whole temperance party; and as early as 1836, one of the Yorkshire district societies, that of Wilsden, ventured to memorialize The British and Foreign Temperance Society of London on the subject of the total abstinence pledge. The answer that it received showed that a disruption was not far off. In Scotland and Ireland, the progress of teetotalism, as distinct from temperance, was not at first very marked; but its votaries were resolute, and held vehement discussions, public and private, with the advocates of the rival system, in which they were generally considered victorious by the crowds before whom they disputed. During 1834-35, teetotalism was struggling hard for recognition in London—the influential leaders of the old temperance society being dead against it. At length, however, owing to the persevering efforts of Mr. Livesey of Preston and other enthusiasts, the teetotalers got a footing, and, in Sept., 1835, established The British Teetotal Temperance Society, which, in Aug., 1836, was merged into The New British and Foreign Society for the Suppression of Intemperance. Teetotalism now in turn began to get the upper hand, and in the course of the next two or three years the "moderate" party almost disappeared; the majority of its members doubtless passing over to the ranks of the total abstainers. But these now fell out among themselves. Up to 1839, The New British and Foreign Society had two pledges, the long and the short; the former including the "neither give nor offer" clause; and the latter omitting it. The more rigorous teetotalers made strenuous efforts to get the "short" pledge abolished, which were as strenuously opposed, and in a very brief period the whole teetotal world was up in wild commotion on the subject. Various meetings of "delegates" from the different societies in England, Scotland, and Ireland were held in London in May, 1839, under the presidency of earl Stanhope, and scenes of the utmost disorder ensued. The result was a temporary disruption, and the formation of two socie

ties. Still the cause prospered in spite of fierce distractions. Strong provincial associations were formed in Yorkshire, Leicestershire, Lancashire, Norfolk, and Cornwall and Wales, almost always on the "long pledge" principle. In Scotland, the "long pledge" took deep root; indeed, after 1837-38, the "short pledge" was scarcely ever thought of. But it was in Ireland that the most brilliant successes attended the movement. In 1838, Father Mathew (q.v.) commenced his extraordinary career, and in less than two years, 1,800,000 men and women were enrolled in Ireland's Great National Total Abstinence Society.

The subsequent history of the movement must be briefly sketched. In Nov., 1842, the disruption, above mentioned, of the British and Foreign Temperance Society was healed, and the two societies which that disruption had called into existence were amalgamated in The National Temperance Society. The work of proselytizing then went on vigorously. Innumerable tracts were circulated, and all Britain echoed with the noise of infinite speech. Excursions, processions, Exeter hall demonstrations, incessant tea-parties, etc., were got up with enthusiasm, which speaks volumes for the energy and sincerity of the teetotal agents. But in a less showy though more noble way, the missionaries of the new faith pursued their benevolent work in the lanes and alleys of large cities, the haunts of profligacy and dissipation, where they sought out the homes of drunkards, and tried (not without success) to rescue them from the power of the horrible vice that was dragging them to destruction. Action of this sort—whatever one may think of the movement as a whole—is to be spoken of only with reference. In Aug., 1846, The World's Temperance Convention met in London, on which occasion 302 delegates were present, representing different societies in the United Kingdom and the United States. Since then, the temperance cause has steadily, if not rapidly, progressed. It has recently been estimated that there are not fewer than 4,000,000 total abstainers (inclusive of juveniles) in Great Britain and Ireland, and a much greater number in the United States of America. Of late years, total abstainers have devoted themselves mainly or largely to advocating the necessity or propriety of imperial legislation on the subject of intoxicating liquor.

One of the recent developments of the temperance movement is that known as *Good Templarism*. It originated in New York in 1851, and rapidly spread through the United States. In 1868, the order established itself in England, in 1869 in Scotland, and in 1870 in Ireland. Its progress has been singularly rapid. In England alone, exclusive of Scotland, Ireland, and Wales, there were in 1875 no fewer than 3,570 "lodges," having 168,425 members, estimated in 1880 to have increased to more than 200,000 persons. These of course do not represent absolutely new adherents to the temperance cause. They are in many cases members drawn from the older temperance societies, though it is also an undoubted fact that the order has been very successful in making fresh converts to the cause of total abstinence. The name is derived from the famous Knights Templars, and originated in a fanciful analogy between the functions of the ancient order of military monks, and the modern disciples of temperance. As the former were enrolled to defend the holy sepulcher and the interests of religion, so the latter are banded together to protect Christianity against a worse foe than the Saracens, viz., "the drinking institutions of the land." It is professedly a *religious* movement, and its ritual is evangelical. Its platform is absolute prohibition of the manufacture, importation, sale, or use of all intoxicating liquors as beverages: but it owes its great popularity to certain peculiarities in its constitution, its picturesque or showy ceremonial, and its aim to combine social and festive amusements with missionary zeal.—See *Good Templarism*, by the Rev. George Gladstone (Glasgow, 1872). A more recent movement, The Blue Ribbon Army, is very successful. The Salvation Army obliges its members to be abstainers.

Pleas and Counter-pleas.—The question of abstinence from intoxicating liquors is capable of being argued on three distinct grounds, *scriptural*, *physiological*, and *social*. We propose to furnish a brief synopsis of the leading arguments *pro* and *con* under each of these aspects. First, then, the *scriptural argument*.

The scriptural argument in favor of abstinence from intoxicating liquor may be briefly stated. The only "strong drink" mentioned in the Bible is wine. It is both praised and blamed. The question raised by teetotalers is: Are the sacred writers referring in both cases to the same kind of wine? This they deny, and endeavor to make good their denial by an appeal to the original Hebrew. On examination it is found that ten or twelve different designations for wine are used, but the two by far the most frequent are *yayin* and *tirōsh*. The first of these is the generic term for wine, and therefore (say the advocates of total abstinence), as it *must* embrace fermented liquor, it is the word used when wine is denounced. Thus, it is *yayin* that is a "mocker" (Prov. xx. 1), that is not to be looked upon (Prov. xxiii. 31, 32), etc. On the other hand, when wine is praised, *tirōsh* is the word used, and *tirōsh* (it is asserted) means the wine in clusters, that is, the actual grape itself, or the unfermented juice thereof, then, as now, liberally drunk as a beverage by the inhabitants of Syria and elsewhere. The application of this view to the New Testament is obvious. If there was a wine that might be used, as well as a wine that was condemned—which, ask the teetotalers, would Christ and his apostles be most likely to sanction? The wine that "maketh red the eyes," that "biteth like a serpent, and stingeth like an adder," that "deceiveth," that "maketh drunken" and "mad;" or the wine that "maketh glad the heart," that is "good," a "blessing," etc.:

—in a word, *yayin* in any of its dangerous forms (*sôbe*, from the root to “soak;” *chemer*, the “foaming or bubbling;” and *mesec*, *mezeg*, *mimsac*, the mixed wines), or the innocent *tîrôsh*, that cheers, but not inebriates? It is conceived that there can be but one answer to this question, and that every candid and reverent Christian must be forced to the conclusion, that the wine which Jesus made at the marriage-feast at Cana of Galilee, and used in his last supper with his disciples, and which Paul advised Timothy to drink for his stomach’s sake, was the unfermented, innocuous, and popular *tîrôsh*.

To this it is replied that the distinction made between *yayin* and *tîrôsh* does not exist. Both parties are agreed that the former term is the generic one (corresponding with the Greek *oinos*, the Latin *vinum*, and the English *wine*, with all of which it is believed to be etymologically connected); but it is denied by the scriptural opponents of total abstinence that *yayin* means fermented, and *tîrôsh*, unfermented wines, exclusively. Not to trench upon the chemistry of the question, which, it is affirmed, wholly disproves the possibility of the “juice of the grape,” being kept for any length of time without undergoing a process of fermentation, and thereby acquiring to a certain degree intoxicating properties, it is alleged that the etymology of *tîrôsh* does not favor the teetotal view. According to Gesenius, it is derived from the root *yârash*, “to get possession of;” that is, of the brain. Dr. Lees, indeed, quotes Bythner as suggesting that it may have been so named because the vine was a “possession” in the eyes of the Hebrews; but this is extremely improbable, and in the absence of other explanations, that of Gesenius is certainly to be preferred. Again *tîrôsh* is not exclusively used to denote the “fruit” (strictly so called) of the vine; the dreaded *yayin* performs the same harmless function—e.g., in Jer. xl. 10, 12, where it is connected with a verb significant of “gathering,” and in Ps. civ. 14, 15, with another expressive of growth. It is even denied that *tîrôsh* is ordinarily to be so understood, for although, being mostly found in connection with “corn,” the verb applied to the consumption of that article of food is by *zeugma* made to apply to the “wine” also, yet in the only passage where the act of consuming *tîrôsh* alone is mentioned (Is. lxii. 8, 9), the verb is *shâthâh*, which invariably signifies the act of drinking. Lastly, it cannot be shown that *tîrôsh*, when it does mean wine, means innocuous wine. No doubt, *yayin* is the one generally employed when wine is denounced, and *tîrôsh* when it is praised, but this is not uniformly the case, for in Hos. iv. 11, “whoredom and wine (*yayin*) and new wine (*tîrôsh*) take away the heart,” *tîrôsh* actually forms (as has been remarked) “the climax” of intoxicating influences. The conclusion, therefore, to be drawn from a consideration of Scripture is, that the distinction insisted on by total abstiners between the two terms—viz., that the one (*yayin*) means fermented, and the other (*tîrôsh*) unfermented wines, is one that cannot be maintained. Both must be held as referring to fermented intoxicating wine; and the praise of *tîrôsh* is simply to be considered a recommendation of the moderate use of ordinary wine, as the condemnation of *yayin* is to be regarded as a solemn prohibition of excess in the same.

The physiological argument in favor of total abstinence necessarily takes various shapes; for it is concerned with physiological questions which are yet, to a great extent, matter of opinion—of speculation and conjecture, not of science. A question arises upon three distinct points: 1st, the effects of alcoholic liquors in quantities sufficient to produce intoxication; 2d, their effects when habitually used in moderate quantities; 3d, the effect of abstaining from them altogether.

Upon the first point, teetotalers usually maintain that insanity, idiocy, almost every form of organic disease, many chronic, not a few acute disorders, are frequent results of habitual intoxication; that the children of drunkards are often idiotic, and have transmitted to them various diseases, which are produced by excessive drinking—which, therefore, tends to the deterioration of the race; that drunkards are always the first victims of epidemics; and that it can be shown from tables of mortality that drinking has a marked effect in shortening life. It is not disputed that many of these effects can be connected with the habitual use of liquors in excess; but as to some of the most striking of them, it is denied that they are physiological effects of such excess—being not direct results of hard drinking, but due to the bad conditions under which poor people who drink hard usually live. The question between teetotalers and those who differ from them, at this point, however, is only a matter of degree. The latter admit that alcohol, in narcotic or intoxicating quantities, produces only injurious results. In such quantities it has a deteriorating, a devitalizing influence upon the brain and nervous tissue, and habitual excess in its use is attended by a progressive impairment of nervous structure, indicated at length by such results as epilepsy or delirium. See INTOXICATION. But the results of excess differ greatly, it is said, in the case of different persons, so that, not unfrequently, many years of hard drinking do not affect the system of the drinker in a marked degree.

It is upon the second point—the habitual use of alcoholic drinks in moderation—that the opinion of teetotalers seriously conflicts with that of many physiologists. The teetotal argument—leaving out minor points, such as an alleged effect of alcohol in impairing the digestion—may be stated thus: 1. Alcohol can never have been intended by nature for the food of men. It is never produced spontaneously in nature. The vegetable world yields in abundance the principles which form the flesh, and those which keep up the heat of the body, but the healthy plant never produces alcohol. In the body too, in health, food is never converted into alcohol. And the body does not

merely not produce alcohol; it treats it as a foreign element, and gets rid of it as fast as possible. 2. Alcohol in the body, by taking up the oxygen supplied through the lungs, checks the burning of tissue, upon which life and the production of energy, muscular or mental, depend; and similarly it impedes the efforts of the body to get rid of the waste matters which are the products of the burning. It thus lowers vitality, vitiates the blood, and prevents the production of healthy fiber. Toddy or beer taken at bed-time, instead of being favorable to health, has just the same effect, according to Dr. Carpenter, with sleeping in a four-post bed with the curtains carefully tucked under the bed-clothes. In either case, that is, there is a diminution of the supply of oxygen required for vital processes, especially for burning the waste of the body. 3. The stimulation produced by alcohol is succeeded by a recoil or reaction; and to produce a certain effect of stimulation, the quantity taken must constantly be increased. From this cause—to say nothing of social influences connected with drinking calculated to produce the same result—moderate drinking tends to pass into excessive drinking, about the evil consequences of which there is no dispute.

The physiological opinion opposed to those arguments is, that while alcohol, like other similar substances, has in large quantities a narcotic, a devitalizing effect, it has in small quantities a stimulating effect, between which and narcotism there is a difference, not of degree, but of kind. The stimulating effect is precisely the same with that of highly-nutritious and easily digested food; as regards the vital functions, it differs from the effect of ordinary food only in rapidity of production. It does not substitute an abnormal for the normal action of the bodily organs; it restores their natural functions; and it is capable of rectifying either deficient or redundant functional action. The only positive difference of effect between ordinary food and alcoholic stimulation is, that the latter does not, to any great extent, add to the bulk of the body. There is no recoil or reaction after it, except that, as in the case of ordinary food, the effect is exhausted after a time. There is nothing to support the belief in a reaction, except the depression involved in the gradual recovery from the narcotic effect of a large quantity of alcohol; but between the narcotic effect of a large, and the stimulating effect of a small, quantity, there is, as already said, a difference of kind—their connection is merely accidental. And the experience of mankind—the fact that moderate drinking does not usually pass into excessive drinking—sufficiently shows that it is not found necessary to increase the quantity used for stimulation. Since stimulation restores the natural functions, it, of course, is capable of removing the consequences of functions being perverted. Thus, it is maintained that, among other things, it gives relief from pain and muscular spasms, reduces the circulation when too rapid, produces healthy sleep, and removes general debility, as well as the fatigue of special organs. Whether it, to an important extent, affects the waste of tissue, or keeps waste matters in the blood, is at present undetermined; however this may be, there is no justification for holding that life is to be measured by the aggregation of tissue, or the rapidity of bodily changes. The notion that alcohol checks the burning of tissue by taking up the oxygen received by the lungs, originated when it was believed, upon the authority of Liebig (it was so believed until a few years ago, but the contrary is generally held now), that alcohol was altogether decomposed in the body. If these views are correct, it follows that alcohol, taken cautiously and in small quantities—the quantities varying with the circumstances and with the constitution of the individual—may be used not only with safety but with advantage.

Under the third head teetotalers, of course, maintain that total abstinence is highly favorable to health. They adduce their personal experience; the mortality statistics of one or two regiments and of ships' crews mainly, or entirely, made up of abstainers; the evidence of arctic voyagers on the one hand, and of travelers in tropical regions on the other, to prove that in every climate health can be maintained, and is most likely to be maintained, when no use is made of alcoholic drinks. On the other side, the fact that men of all races use alcoholic beverages is held to show that men, living as men must usually do, find those beverages useful, if not necessary. It is not disputed that many persons live in health without them—that persons having an abundance of wholesome food, not over-worked, living in well-constructed houses, and in wholesome air, can usually dispense with them. But when some, or all, of those conditions are wanting—which in towns, at any rate, happens in all but exceptional cases—it is alleged that a nearer approach to health is made when a moderate use is made of alcohol.

The social arguments in favor of total abstinence, though very weighty and earnestly insisted upon, can be indicated in a few sentences. It is affirmed that the use of alcoholic drinks is at the root of all the misfortunes of the poorest and most numerous class, that it is the chief cause of pauperism, the chief cause of crime, a frequent occasion of immorality; that it lowers the health and shortens the life of the great mass of artisans and laborers, makes their homes wretched, and exposes them and their families to the evils and temptations of chronic destitution. Then, such are the seductive influences of drink and good-fellowship, that moderate drinkers are in danger of becoming drunkards; thus the use of liquors effects the ruin of a considerable percentage of the middle and upper classes. Total abstinence is demanded as a measure of personal precaution, because no one who drinks at all is safe against falling into drunkenness; as a patriotic duty, incumbent upon those who desire the improvement of the poorer classes; as a duty

of example which every man owes to his neighbor, and which, involving self-denial, must have a favorable reflex influence upon character. On the other side, it is not denied that drinking is closely connected with, or that it exasperates, the misery undergone by the poor; but it is denied that it is the cause of the misery. It is maintained that drinking must be regarded as an effect of the bad conditions inherited by the poor, and under which they live. Persons born in close alleys, and brought up in foul air, living always from hand to mouth, often upon insufficient or unwholesome food, feel (it is said) a need of stimulants to support vitality. It is affirmed that the fluctuations of crime (properly so called) do not depend upon the amount of drinking, but—so far as they can be traced to one circumstance—upon variations in wages; that it is destitution, not drunkenness, that contributes most largely to the production of crime. The drunkenness, the crime, the pauperism, it is maintained, cannot be permanently reduced except through a material and moral improvement being effected among the poor. Then it is denied that moderate drinkers, in general, are in any danger of becoming drunkards; it is persons wanting in prudence, and of intemperate constitution, who are exposed to that danger.

Of late years total abstiners—in unison with others who, though not themselves abstiners, are anxious to promote public sobriety—have exerted themselves to obtain, in one shape or another, a legislative prohibition of the trade in drink. This movement was set on foot in Great Britain in 1853, by an organization called "the United Kingdom alliance," on account of the success which had crowned the exertions of teetotalers in Maine and many other of the United States. In Maine the liquor traffic was suppressed in 1846; the law was made more stringent by a provision for confiscating all alcoholic drinks in 1851; and though in 1856 the existing laws were repealed, and it became lawful to distill spirits, to sell spirits, and to have spirits in possession, drinking-houses continued to be prohibited. The "alliance" soon found that there was no possibility of carrying a Maine liquor-law through the British parliament; and they accordingly confined themselves to asking for a permissive bill, enabling the ratepayers of a parish, if a majority of two-thirds think fit, to suppress all public-houses within the parish. They now demand local option (see PROHIBITION). They support the bill upon the merits by a variety of arguments. Alcohol, they say, being a poison, its sale ought to be subject to the same restrictions as that of other poisons. The legislature has admitted the exceptional and dangerous nature of the liquor trade, by putting it under strict regulation; in consistency, it should suppress it as a trade altogether. They allege that the amount of drinking in a place always varies directly with the number of public-houses; and then that the amount of crime and of pauperism varies directly with the amount of drinking. In 1857 Dr. Lees calculated the expense of the use of liquors to this country at 120 millions a year—the cost of the liquor being put at 60 millions, and the remainder of the amount made up by allowing for the crime and pauperism caused by drinking, the loss of time in drinking, and, through disease induced by drinking, the waste of life consequent upon it and many minor items. This money, it is said, if not spent upon drink, would have a marvelous effect in improving the condition of the poor. On the other side, it is maintained, *in limine*, that the subject-matter of this bill is so very important, and so full of difficulty, that parliament should not delegate its functions in respect of it to the ratepayers; also, that to do so would be to plant, in every parish in the country, the seeds of perpetual strife. Upon the merits it is said that a prohibitory law could not be carried out—at any rate, in large towns where the worst evils connected with drinking are found; and that systematic attempts at evasion would be made, which would demoralize the people, and put them in chronic antagonism to the law. Besides the arguments already stated upon this side, it is urged that—excepting the case of poisonous substances—it is no part of the duty of a governing body to say to its people: You shall not spend your money upon this or that; that it is unreasonable, in a fiscal point of view, to speak of the national resources being wasted upon liquors any more than upon tea or beef, or other substances that perish with the using; and that the power of procuring articles which are desired is what men work for—the great motive of industry. It is also maintained that compulsory abstinence from drink would not produce the same results as voluntary abstinence; that men would seek indemnifications, resorting, it might be, to other and more injurious narcotics than alcohol, and to vices which might be even more injurious than drinking. It is said that abstinence, to be valuable, must be a sign of a moral improvement; and that it is safest we should leave the poor to face the temptations of their situation, trying to fortify them against these temptations by education, by giving them just, moral, and religious views; at the same time holding before them the spectacle of temperance and its results in the case of the more comfortable classes. See PROHIBITION, etc.

The following are the leading organizations in Great Britain that, with various modifications of creed, carry on the temperance agitation. They can claim as directors and advocates men of acknowledged position and ability; and the aggregate sum of money spent annually is very great. The National Temperance League, London (organ, the *Weekly Record*); the United Kingdom Alliance, Manchester, with numerous branches (organ, the *Alliance News*); the Church of England and Ireland Temperance Society, London (organ, the *Church of England Temperance Magazine*); the Scottish Temperance League, Glasgow (organ, the *League Journal*); the National Band of Hope Union, London

(organ, *Band of Hope Review*). Besides these, the Roman Catholic and Methodist branches of the temperance society form distinct organizations, while the Order of Good Templars has its organs in the United States, and in England, Scotland, and Ireland. See **BAND OF HOPE**. For temperance as a political question, see **PROHIBITION PARTY**.

TEMPERATURE OF THE BODY IN HEALTH AND DISEASE. It is universally admitted as a result of the observations of numerous physiologists, among whom our own countryman, Dr. John Davy, stands pre-eminent, that although the range of temperature varies in different parts of the human body, the normal temperature at completely sheltered parts of the surface amounts to $98^{\circ}.4$, or a few tenths more or less in temperate climates; and that if there is a persistent elevation above $99^{\circ}.5$, or a depression below $97^{\circ}.3$, some form of disease is certainly indicated. (In warm-blooded animals, generally, the temperature is one degree lower at completely sheltered parts of the surface than in the back of the mouth, or other accessible internal parts.)

Some of the circumstances which cause a deviation from the normal temperature are mentioned in the article on **ANIMAL HEAT**. It may be further noticed, that exposure to cold without exercise, and sustained mental exertion, reduce the temperature, and that the amount of heat is at first reduced after a full meal, although, as stated in the above-named article, it subsequently rises. Moreover, in the tropics, the average temperature is nearly 1° higher than in temperate regions.

When the temperature rises in cases of disease, the following relation to its augmentation and that of the pulse has been established: *an increase of temperature of 1° above 98° corresponds with an increase of 10 beats of the pulse in the minute*. Thus, if the pulse is 60 at 98° , it is 70 at 99° , 80 at 100° , and so on. It is now established beyond all doubt, by the observations of Wunderlich, Virchow, and many other foreign physicians, and by Parkes, Jenner, Aitken, and Ringer in this country, that the preternatural heat which in certain cases can be detected by the thermometer, and may exist to the extent of 4° , 6° , or even 8° above the healthy average, and which varies in amount in different diseases, in different persons, and at different times of the same day, is the essential symptom of fever. Dr. Davy, in his *Physiological and Anatomical Researches*, vol. i. p. 206, describes the case of a lunatic soldier, in whom the accidental discovery that his temperature was 6° above the normal standard, led to the detection of tubercular disease of the lungs and intestines. Wunderlich, whose experience embraces at least half-a-million exact thermometric observations, bears unqualified testimony to the value of this mode of investigation in the early detection of disease, and as often furnishing an important guide to treatment. Some of these instances are quoted by Dr. Aitken in his *Science and Practice of Medicine*, 3d ed. vol. i. pp. 44-46.

We give in a condensed form a few of the more important of these observations. In *ague*, the temperature of the body begins to rise several hours before the beginning of the paroxysm, and after the disease *seems* to have disappeared, a periodic increase of the temperature may still be detected, and as long as this continues, the patient is not really cured. In *typhoid fever*, the rise of temperature, or its abnormal fall, will indicate what is about to happen three or even four days before any change in the pulse or other sign of mischief has been observed. A sudden fall of temperature has thus denoted intestinal hemorrhage several days before it appeared in the stools. A fall as low as 93° was noticed by Parkes in a case of this kind. When a person, who yesterday was healthy, exhibits this morning a temperature above 104° , it is almost certain that an attack of ephemeral fever or *ague* is coming on, and should the temperature rise up to or beyond $106^{\circ}.3$, the case will certainly turn out one of *ague* or of some other form of malarious fever. If, during the first day of illness, the temperature rises to 106° , it is certain that the patient does not suffer from typhus or typhoid fever; and if the temperature of a patient, who exhibits the general signs of pneumonia, never reaches $101^{\circ}.7$, it is certain that there is no soft infiltration in the lungs. "In typhoid fever, a temperature which does not exceed on any evening $103^{\circ}.5$, indicates a probably mild course of fever. A temperature of 105° in the evening, or 104° in the morning, shows that the attack is a severe one, and forebodes danger during the third week. On the other hand, a temperature of $101^{\circ}.7$, and below, in the morning, indicates a very mild attack, or the commencement of convalescence. In pneumonia, a temperature of 104° and upward indicates a severe attack. In acute rheumatism a temperature of 104° is always an alarming symptom. In a case of jaundice otherwise mild, an increase of temperature indicates a pernicious turn. In tuberculosis, an increase of temperature shows that the disease is advancing, and that untoward complications are setting in. In short, a fever temperature of 104° to 105° in any disease indicates that its progress is not checked, and that complications may still occur."—*Op. cit.*, p. 21. We may further observe that, from the observations of Dr. Sidney Ringer, a persistent elevation of temperature exists as an invariable precursor of the growth of tubercle in any organ. As a general rule, when the temperature rises continuously to $106^{\circ}.2$, the prognosis is unfavorable; and when it rises to 110° , a fatal issue is almost certain. The diseases in which the highest temperatures have been observed are scarlatina, in which it has been noted at 112° , and tetanus, in which, at the period of death, it was $112^{\circ}.5$, and an hour afterward was $113^{\circ}.8$. In Dr. Aitken's work, the reader will find a series of diagrams illustrating the range of temperature in *ague*, *erysipelas*, *measles*, *pneumonia*, *simple continued fever*, *scarlatina*,

small-pox, typhoid and typhus fevers, etc., together with a full description of the instruments to be used, the method of using them, and practical rules for recording observations.

TEMPERED, or TOUGHENED, GLASS, glass in a peculiar molecular condition, produced by placing it while hot in a tight box containing oil. The box is tight to prevent ignition of the oil. The surface to variable depths, depending upon the conditions of the experiment, becomes very hard, and apparently tough, for articles of glass prepared by this method may be thrown with considerable violence upon the ground without breaking. When, however, they do break they are shattered into minute fragments, after the manner of prince Rupert's drops (q.v.), indicating that the molecules of glass are held together in a condition of strain, and this is shown to be the case by an examination of the optical properties of the glass. Continued jarring will produce disintegration, and the material will not bear to be ground. It is the invention of M. de la Bastie of France.

TEMPERING STEEL. A peculiar effect is produced upon steel by heating it to redness, and then suddenly cooling it. By this means, extreme hardness is obtained. Steel is so susceptible to this process, called tempering, that almost any degree of hardness and brittleness can be obtained. If, for instance, we make a piece of steel red-hot, and then plunge it into cold water, it becomes hard and brittle when cold, and is actually, though slightly, increased in bulk. But if we reheat the metal, and allow it to cool slowly, it again becomes soft and malleable as before. Moreover, if we again reheat it, but not to redness, and cool it suddenly, it is still further softened. If, before reheating, the surface has been polished, a beautiful shade of color is produced by the heat, which is varied according to the temperature employed; and so exactly is this the case, that the experienced manipulator is entirely guided by the color produced, instead of by nice regulations of the heat applied. For ordinary operations, the metal is cooled by plunging it in cold water; but oil, mercury, and saline solutions are used for special purposes. An exact series of experiments has proved that the following colors are produced at the temperatures given: very pale yellowish, by 430° Fahr.; pale straw, 450°; yellow, 470°; brown, 490°; mottled brown, 510°; purple, 530°; bright blue, 550°; blue, 560°; dark blue, 600°.

TEMPLARS, GOOD. See **TEMPERANCE.**

TEMPLAR, KNIGHTS, a celebrated religious and military order, founded at Jerusalem in the beginning of the 12th c., by Hugues de Paganus, Geoffroy de St. Omer, and seven other French knights, for the protection of the Holy Sepulcher, and of pilgrims resorting thither. Baldwin II., king of Jerusalem, bestowed on this order their first place of residence; and an additional building was acquired from the abbot and canons of the church and convent of the temple, whence the order obtained the name of the "poor soldiers of the temple of Solomon," afterward abbreviated into templars. The knights were bound by their rule to hear the holy office every day, or if prevented by their military duties, to say a certain number of paternosters instead; they were to abstain from flesh four days in the week, and from eggs and milk on Fridays. They might have three horses and an esquire each, but were forbidden to hunt or fowl. In the earlier period of their history, the templars made a great show of poverty, contrasting much with their later condition. After the conquest of Jerusalem by the Saracens, they spread over Europe; their valor became everywhere celebrated; immense donations in money and land were showered on them; and members of the most distinguished families thought themselves honored by enrollment in the order. In every country where they existed, they had their governor, called the master of the temple or of the militia of the temple. The templars had settlements in England from an early period. The first was in London, on the site of Southampton buildings, Holborn; but from 1185 their principal seat was in Fleet street, still known as the temple.

The templars were at first all laymen and of noble birth. Pope Alexander III., however, in 1162, authorized the admission of spiritual persons not bound by previous vows, as chaplains to the order, who were not required to adopt the military vows. A third class was afterward introduced, consisting of laymen not of noble birth, who entered as serving brothers, some of them being attendants on the knights, and others exercising trades in the houses or lands of the order. Eventually, many persons became affiliated members without taking the vows, for the sake of the protection afforded them. As the power and prosperity of the templars increased, so did their luxury, arrogance, and other vices, which gave the French kings a pretext for endeavoring to suppress them, and lay hold of their possessions. Accusations, many of which were absurd and incredible, were brought against them by two members of their own body. Their principal enemy was Philippe IV. of France, who induced pope Clement V. to accede to a scheme by which the whole members of the order were seized and imprisoned, their lands confiscated, and many of them tried, convicted, and executed for capital crimes. The English templars were arrested by command of Edward II.; and a council held in London in 1309 having convicted them of various crimes, most of which were probably imaginary, the king seized their possessions. In 1312 the whole order throughout Europe was suppressed by the council of Vienne, and its property bestowed on the

knights of St. John, to which latter order their English possessions were formally transferred by a statute of Edward II. in 1323.

The habit of the templars was white, with a red cross of eight points of the Maltese form worn on the left shoulder. Their war-cry was "beau seant;" and their banner, which bore the same name, was parted per fess sable and argent. They also displayed above their lances a white banner charged with the cross of the order. Their badges were the *Agnus Dei*, and a representation of two knights mounted on one horse—indicative of the original poverty of the order.—See Addison's *History of the Knights Templars, the Temple Church, and the Temple* (Lond. 1842); A. O. Haye's *Persecution of the Knights Templars* (Edin. 1865).

As to the modern society called Knights Templar, see ASSOCIATIONS, SECRET AND BENEVOLENT.

TEMPLATE, a mold in wood or metal, showing the outline or profile of moldings, and from which the workmen execute the molding.

TEMPLE (so called because the Knights Templars had one of their branches in that part of London), in its connection with the law of England, is a part of the city of London occupied exclusively by barristers or attorneys, with few exceptions. It is the joint-property of the two Inns of Court (q.v.), called the societies of the inner temple and middle temple, each of which has a right of calling persons to the degree of barrister—a privilege shared by the two other Inns of Court, Gray's Inn (q.v.) and Lincoln's Inn (q.v.). The temple consists of buildings occupied by barristers, who rent the same from the above two societies, who are the private proprietors, and issue their own regulations as to the management of the property.

TEMPLE, DANIEL, 1789–1851; b. Mass.; graduated Dartmouth college, 1817, and Andover seminary, 1820; sailed as a missionary of the American board to the east, 1822, with a printing-press; stationed at Malta, 1822–28, and had charge of the press; resided at Smyrna, 1832–44; returned to America, 1844. He published many books in modern Greek, Italian, and Armenian, wrote many scriptural histories, and edited and contributed to a monthly magazine in modern Greek. His life and letters were published after his death by his son, the Rev. Daniel H. Temple.

TEMPLE, FREDERICK, D.D., b. on Santa Maura, one of the Ionian islands, Nov. 30, 1821; graduated with the highest honors at Balliol college, Oxford, 1842; was fellow and tutor in mathematics; ordained in the church of England, 1846; principal of the training college, Kneller Hall, 1848–55; an inspector of colleges, 1856–58; master of Rugby school, 1858–69; appointed bishop of Exeter, 1869, his confirmation as such being ineffectually opposed because of his share in writing, 1860, the well known *Essays and Reviews*. He was one of the queen's chaplains, and published three volumes of sermons preached in Rugby chapel; was, 1883, April, elected Bampton lecturer at Oxford for the ensuing year; and 1885, Jan., was transferred from the see of Exeter to that of London, left vacant by the death of Bp. Jackson. In 1897 he was made archbishop of Canterbury.

TEMPLE, Sir RICHARD, b. near Worcester, England, 1826; entered the Indian civil service in 1848; was knighted, 1867; became lieutenant-governor of Bengal, 1874; and governor of Bombay, 1877. Returning to England, he was a member of the school board of London, 1886–94, and in 1885 entered parliament. His publications include *India in 1880*; *Men and Events of My Time in India* (1882); *Oriental Experiences* (1883); *Cosmopolitan Essays* (1886); *Palestine Illustrated* (1888); *Memoirs of John Lawrence* and *James Thomason*; *Life in Parliament*; and *Story of My Life*.

TEMPLE, RICHARD GRENVILLE, Earl, 1711–79, b. England; returned to parliament from Buckingham, 1734; and in 1752 succeeded to the earldom. He was a political associate of William Pitt, and held the positions of lord of the admiralty, 1756–57, and lord privy seal, 1757–61. The *Grenville Papers* (1852–53), edited by W. J. Smith, consist of the correspondence between Pitt and George and Richard Temple. They throw much light on the political and court life of the period.

TEMPLE, Sir WILLIAM, an eminent diplomatist and popular writer, was the eldest son of sir John Temple, master of the rolls in Ireland. He was born in London in 1628, studied for two years at Emmanuel college, Cambridge (where he had the celebrated Dr. Ralph Cudworth for tutor), and at the age of 19 went abroad on his travels. He acquired the French and Spanish languages, and also cultivated his taste for English composition. He entered on public life in 1661, as member for the co. of Carlow, in the Irish parliament. In 1665 he was selected to proceed to Westphalia on a secret mission to the bishop of Münster; and on his return he was created a baronet, and appointed resident at the court of Brussels. His most important diplomatic success was the famous treaty of 1668, known as the triple alliance, by which England, Holland, and Sweden bound themselves to unite in curbing the ambition of France. This negotiation was accomplished in five days, in conjunction with the great Dutch statesman, De Witt. At the congress of Aix-la-Chapelle, and at the subsequent treaty of Nimeguen, Temple was also a negotiator. He was long ambassador at the Hague, and assisted in bringing about the marriage of the Prince of Orange with the Princess Mary. Charles II. in vain endeavored to prevail upon him to accept the appointment of secretary of state; but though shunning such arduous duty, he attempted to reform the government by establishing, with consent of the king, a privy council of 30 persons, by whose

deliberations his majesty promised to be guided in all public affairs. As might have been foreseen, so numerous a council, under such a sovereign as Charles, and in times of such fierce rivalry and faction, proved an utter failure. Temple then finally abandoned politics, and retired to the country. In fact, the chief aim and desire of this accomplished statesman was to enjoy lettered ease and leisure, apart from all exciting public care and responsibility. When the revolution placed William III. on the throne, Temple was again solicited to become secretary of state; but he again refused. The remaining ten years of his life were mostly spent at his favorite seat of Moor Park, in Surrey, where he carried out his schemes of planting and landscape gardening, and realized his early wish for studious retirement. During this period he had, as secretary and humble companion, the immortal Jonathan Swift, who regarded his stately self-complacent patron with more fear and distrust than affection, but who ultimately became his literary executor. Temple died at Moor Park, in Jan., 1699. His collected works form four volumes (Lond., 1814).

As an author Temple is now known chiefly by his historical *Memoirs*, and his *Miscellanea*, the latter being a collection of essays on various subjects—as government, trade, ancient and modern learning, gardening, heroic virtue, and poetry. He has been considered one of the reformers of our style; “the first writer,” says Johnson, “who gave cadence to English prose.” His style has quite a modern air, and is smooth, copious, and agreeable. He is too pretentious as respects scholarship and learning, and has no weight as a political writer; but he expatiates very pleasantly on foreign travel and country life, on flowers and fruits, on parterres, terrace-walks, and fountains.

TEMPLE OF SOLOMON AT JERUSALEM (Beth Jahveh). A temple on Mount Moriah, Jerusalem, 2419 feet above the Mediterranean, and built in the fourth year of Solomon's reign. It was the first work of importance constructed by the Jews. It followed the outline of the Tabernacle with doubled proportions and innovations, and was designed as a place for worship, a dwelling for the priests, and a place for public assembly. As all attempts to restore it are conjectural, the best idea is received through comparative study of ancient architecture; and scholars now agree that its style was Phœnician. It is supposed to have resembled the Temple of Astarte at Paphos, and Hierapolis, described by Lucian, offers a parallel, facing the East like Solomon's, decorated with gold work, and having before its portals, adorned with twin pillars, a brazen altar within a walled court. (See T. L. Donaldson, *Architectura Numismatica*, London, 1859.) The chief motives of ornamentation were palm-tree and cherub; the former a common Phœnician device, the latter a variety of sphinx. Tradition has accepted the most extravagant statements regarding the magnificence of Solomon's Temple, the only descriptions of which are I. Kings iv.-ix. (the most ancient and trustworthy); I. Chronicles ii.-vii.; Josephus, *Antiq.*, viii.; and Eupolemus in Eusebius, *Præp. Ev.* Solomon first appealed to Hiram, King of Tyre, for architects and workmen, and, upon agreement of yearly tribute, assistance was granted. Three years were spent in amassing materials. Four classes of men were employed: (1) 30,000 native Israelites working in relays of 10,000 every three months in the forest of Lebanon, whence timber was sent by floats to Joppa, and dragged to Mount Moriah; (2) Phœnicians, who worked for pay; (3) slaves, home-born and captured; (4) vassal Canaanites, numbering 70,000 burden-bearers and 80,000 quarrymen under 3600 Israelite officers. Skilled Sidonian artisans were employed in molding and carving the gold and brass, and coloring and embroidering the hangings with the famous Tyrian dyes of purple and scarlet. The summit of Mount Moriah was enlarged and supported by massive walls, the stones being hewn from the subterranean quarries over which Jerusalem is built, and cisterns and conduits of immense capacity were constructed. The Temple, completed in seven years and a half, was the centre of national life and the symbolical dwelling of Jehovah among his chosen people. None but priests ever entered its sacred portal, and only the High Priest once a year was permitted to approach the Oracle, or Shrine, known as Holy of Holies. The people, who worshipped in the open air in the Outer Court below the “Priest's Court,” never beheld the wonders of the Temple. Briefly, it was a building 60 × 20 cubits and 30 cubits high, of huge stones, roofed and floored with cedar overlaid with gold, having rooms shaped like cubes, and upper stories of light woodwork—all characteristic features of Phœnician architecture. Before the portico stood two bronze pillars—Jachin and Boaz—40 cubits high, with lotus capitals and further decoration of network encircled with pomegranates. Through a door of cypress overlaid with gold the priests entered the sanctuary, decorated with gold and carved with pomegranates, lotus, and palms. Here stood the altar of incense, the table for shewbread, and the golden candlesticks. These, with all the vessels for service, were golden. The Sanctuary was separated from the Oracle by a two-leaved door of wild olive-wood covered with gold and ornamented with cherubim, flowers, and palm-trees. This was always open, but a veil, or tapestry, of purple and crimson, bearing the emblem of the winged cherubim and festooned with golden chains, concealed the Holy of Holies from view. This small room, enveloped in mystery, contained the Ark standing on a rock and protected by Solomon's two cherubim, ten cubits high, with outstretched wings, five cubits long, touching over the Ark and resembling the winged emblems of Egypt and Assyria. The immediate enclosure, 600 feet square, known as the “Priests' Court,” was shut in by three gates, and in it stood the great brazen altar, directly in front of the twin pillars

of the Temple. Not far away was the "Sea of brass" for the ablutions of the priests, consisting of a reservoir, shaped like a lily blossom, festooned with bronze garlands, and standing on the backs of twelve brazen oxen. Five caldrons on wheels for conveying water, and adorned with emblems, stood on each side of the Temple. The "Outer Court," 900 feet square and separated by a wall, contained no permanent structure, but was crowded morning and evening with worshipers and priests, for here the sacrifices of the people took place. The enclosing walls of the Temple and its two courts were 10½ feet high and 9 feet thick.

The dedication (996 B.C.) was delayed nearly a year after the Temple was finished. The relics of the Tabernacle and its ancient furniture were borne from Gibeon in triumphal procession, in which Solomon took part; and, after the people had watched the Ark pass into the Temple, from which it never issued until carried away by Nebuchadnezzar four centuries afterwards, Solomon took his seat on a huge throne erected for the purpose in the "Priests' Court," and visible to the audience in the "Outer Court." In front of him on the altar steps the white-robed priests and musicians stood with their harps, cymbals, and psalteries. At a signal of the trumpets the entire assembly sang hymns of praise, and, after the king's prayer, blessing, and exhortation, followed the stupendous slaughter of 22,000 oxen and 120,000 sheep. To meet the increased demands for service, the duties of the 38,000 Levites were reorganized. The general care of the Temple was given to 24,000; 6000 were made judges and officers; 4000 porters, and 4000 musicians (3700 being singers) appointed for the stately antiphonal and instrumental services. Canon Farrar says in his *Solomon* (London, 1887) that "the taste of a modern worshiper would have been shocked beyond measure by the appearance and smell of the Temple Court. On many occasions it must have been converted into a ghastly *abattoir*, which, but for immense care in purification, would soon have been prolific of pestilence. In that comparatively confined area cattle, large and small, were constantly being slain to the number of many thousands. The floors must literally have swum with blood, and under the blaze of Eastern sunlight, the burning of fat and flesh on the large blazing altar must have been carried on amid heaps of sacrificial foulness."

Solomon's Temple was plundered by Shishak, King of Egypt, thirty years after completion, and finally destroyed by the Chaldeans under Nebuchadnezzar (B.C. 484). It was rebuilt by Zerubbabel (B.C. 520), in a style inferior to the first, and supposed to have been Persian in design. The same ritual was observed, but it became a sort of priestly citadel. Antiochus Epiphanes erected on the altar of burnt offering the Temple of Jupiter Olympus (B.C. 173), but the Maccabees restored the Jewish religion (B.C. 165). Twice ruined in war, the bulwarks were twice rebuilt, and at the time of Pompey's siege (B.C. 63), it was almost an impregnable fortress. Herod laid siege (B.C. 37), and began its reconstruction (B.C. 17). His edifice, with its numerous buildings, was a little city enclosed in its own fortifications and entered by various gates. For the Temple proper the ancient ground plan and dimensions were preserved, and the Oracle remained in the same spot. The Greek-Roman influence was seen in the vast colonnades and cloisters, the eastern one being known as Solomon's Porch, because it rested on the supposed foundation of the original. During the siege of Jerusalem by Titus (A.D. 70), the Temple perished in a conflagration, and, as all traces of it have disappeared, its exact position has for years been one of the most fiercely contested points in Jerusalem topography. The latest results of excavation seem to support Fergusson's theory that it occupied a square of 600 feet at the s.w. angle of the Harâm enclosure, which agrees with Josephus.

Mount Moriah is endeared to Mohammedans and Jews, being revered as the Tomb of Solomon, the place where Abraham offered Isaac, the praying spot of David, Elijah, and the prophets, "the threshing-floor of Araunah" (Chronicles II., iii.), and associated with Mohammed. Here he rested after his miraculous journey from Mecca to Jerusalem, and from it he is thought to have ascended into heaven upon his steed, El-Borak. Sakhra, the Sacred Rock, is said to bear a foot-print of Mohammed and a hand-print of the Angel Gabriel, and beneath it the Ark of the Covenant is now supposed to rest. The famous Basilica called *The Dome of the Rock* (Kubbet es Sakhra), popularly known as the *Mosque of Omar*, is built upon the Sakhra, which rises out of the marble pavement in nearly the centre of Mount Moriah. In *Temple or Tomb* (London, 1880), Sir Charles Warren says the "Sakhra is the traditional site of Solomon's Temple among the Jews, and that all Jewish and Mohammedan writers concur in supposing the Sakhra to have been the Holy of Holies." The construction of the Dome of the Rock, which has been compared in beauty to the Taj Mahal, and of which a good description is contained in Sir Charles Wilson's *Jerusalem: the Holy City* (London, 1889), has been the subject of controversy. It is variously attributed to Omar-ben-al-Khataab, Constantine, Justinian, and the Arabs under Byzantine influence. For accounts of this and the neighboring Mosque el Aksa, see T. Hayter Lewis, *The Holy Places of Jerusalem* (London, 1888); Sir Charles Wilson, *Temple or Tomb* (London, 1880); Comte Melchior de Vogüé, *Églises de la terre sainte* (Paris, 1860); Sepp, *Die Felsenkuppel eine Justinianische Sophienkirche* (Munich, 1882); Procopius, *Buildings of Justinian* (translated by Aubrey Stewart in *Palestine Pilgrims' Text Society*, London, 1886); and Mukad-dari (*Palestine Pilgrims' Text Society*, London, 1886). These buildings and others used by the Knights Templars stand in an enclosed space known as Harâm es Sherif, now the scene of excavations. The work undertaken by the Palestine Exploration Fund has revealed the enormous height of Herod's walls, now supposed to have been reconstructed on

the original masonry; and although these are not entirely uncovered, they seem to justify the measurements of Josephus, until recently considered exaggerated. The literature of the subject is enormous, one of the first important works being by the brothers Pradi, Spanish Jesuits, known as Villapandi, a superbly illustrated folio (Rome, 1596-1604). See Josephus, *History of the Wars of the Jews and Jewish Antiquities*; L. Capina, *Tempio di Gerusalemme* (Rome), and *L'Architettura Antica* (vol. i.); De Vogüé, *Le Temple de Jerusalem* (Paris, 1864); Thrupp, *Antient Jerusalem* (Cambridge, 1855); Fergusson, *Topography of Jerusalem* (London, 1847); do., *The Temples of the Jews* (1878); do., *History of Architecture* (1863-'67); do., *Principles of Beauty in Art* (1849); Lewin, *The Siege of Jerusalem by Titus* (London, 1867); Wilson and Warren, *The Recovery of Jerusalem* (London, 1871); Perrot et Chipiez, *Histoire de l'Art* (Paris, 1887); Charles W. Wilson, *Jerusalem* (London, 1889); Mrs. Margaret Oliphant, *Jerusalem* (London, 1891); E. Robinson and E. Smith, *Biblical Researches in Palestine* (Boston, 1841); Timothy Otis Paine, *Solomon's Temple, or Holy Houses of the Hebrew, Chaldee, Syriac, Samaritan, Septuagint, Coptic, and Itala Scriptures, Josephus, Talmud, and Rabbis* (with plates, Boston and New York, 1885); E. C. Robins, *Review of Various Theories, etc., respecting Solomon's Temple* (Dryden Press, London, 1886); Banister, *Temples of the Hebrews* (London, 1861); *El-Sinti: History of the Temple from the Arabic*, by Reynolds (London, 1837); Bennett, *Temple of Ezekiel* (London, 1824); Meyer, *Der Tempel Salomons* (Berlin, 1830); Hirt, do. (Berlin, 1809); Bähr, do. (Carlsruhe, 1848); Keil, do. (Dorp, 1839); Rosen, *Der Tempel-Platz des Moria* (Gotha, 1866); *Monographs in Hebrew*, by C. Altschul (Amsterdam, 1724); J. M. Altschul (do., 1782); W. Altschul (Sklov, 1794; Warsaw, 1814); Heller (Prague, 1602); Chefetz (Venice, 1696); Snizler (London, 1825); Leone (Amsterdam, 1660); and *Publications by the Palestine Exploration Fund* of London, notably *The Jerusalem Volume*, by Sir Charles Warren (1884); *History of Jerusalem*, by Walter Besant and E. H. Palmer (1871), and *Thirty Years' Work in the Holy Land*, by Walter Besant (London, 1895).

TEMPLEMORE, a market-t. of the co. of Tipperary, province of Munster, Ireland, is supposed to take its name from a commandery of the knights templars, and is situated on the right bank of the river Suir, 9 m. n. of Thurles. The pop. in 1891 was 2433.

TEMPO (Ital. time), the degree of rapidity with which a piece of music is to be executed. The rhythmical proportions of notes, as indicated by their form, give them only a relative value, and have no reference to the absolute speed with which the composition should be played. Some compositions require, from their character, a quick lively movement; for others, a slower movement is more suitable; and different terms are used to indicate different gradations of movement. Of these the principal, beginning with the slowest, are: *Largo*, broad; *larghetto*, somewhat broad; *lento*, dragging; *grave*, heavy, solemn; *adagio*, slow; *andantino*, moving a little; *andante*, moving; *allegretto*, somewhat lively; *moderato*, moderately quick; *allegro*, lively; *vivace*, with vivacity; *presto*, rapidly; *prestissimo*, with great rapidity. These terms are not always used with the precision that might be wished, and sometimes apply more to the character than to the absolute speed of performance. They are often modified by other qualifying words, as *allegro con brio*, lively and with briskness; *allegro appassionnato*, passionately excited. The *tempo* is indicated with more exactness by a reference to the beat of the metronome (q.v.). Thus, M.M. ♩ = 120, signifies that 120 beats of the metronome, each representing a crochet, are to fill up the space of a minute; M.M. ♪ = 60, that 60 quavers are to be performed in a minute.

While the general rule is, that the time of a movement is to be steady and unvarying, cases often occur where a certain part of a composition has to be taken quicker or slower than the rest; this is indicated by such terms as *più vivo*, more lively; or *ritenuto*, kept back; while a return to the original time is expressed by the words *a tempo*. The performer may be required to proceed from one degree of movement to another, not abruptly, but gradually; the terms used to express this are: *ritasciando*, slackening; *ritardando*, retarding; *calando*, calming down; *stringendo*, pressing on; *accelerando*, gradually increasing speed; with some others.

TEMPO RUBATO (stolen time) is the name given to a mode of performance in which a restless character is imparted by protracting one note beyond its proper duration, and curtailing another, so that the aggregate duration of each measure remains unchanged.

TEMPORAL BONES. See SKULL.

TEMPORAL POWER (OF THE POPE) is a phrase susceptible of two meanings, which are very distinct from each other, and the confusion of which has led to frequent and serious misunderstanding.

I. In one of these senses it means the sovereign power which the pope possessed as ruler of the so-called papal states (q.v.), and which, especially of late years, has been the subject of much controversy. The power which the pope exercised within his own states, although modified in its exercise by his spiritual character, was in substance the same as that of any arbitrary sovereign. The history of its origin and progress, and of the variation of the limits within which it has been acknowledged, is briefly detailed under the head PAPAL STATES. The question as to the necessity or utility of such a power vested in the hands of a spiritual ruler, and even of its lawfulness and its compatibility with his spiritual duties, has been very warmly debated; nor is this controversy of entirely recent origin. Many of the mediæval sectaries put forward the principle of the incompatibility of the spiritual with the temporal power in the same person, not only in relation to the pope, but also as to the baron-bishops or other ecclesiastical

seigneurs of that age. Such were the doctrines of the Vaudois, of Pierre de Bruis, and above all, of Arnold of Brescia. The last-named of these rendered himself specially obnoxious by the activity and even turbulence with which he propagated this view, and the sentence of death under which he suffered was the penalty of rebellion quite as much as of heresy. Through the centuries which followed, the anti-papal controversies turned so entirely upon doctrine, that there was little room for the discussion of this question, and it is a mistake to suppose, as has not unfrequently been done, that it entered in any way into the conflict of Gallican and Ultramontane principles. Even the great Gallican champion, Bossuet, not only admitted the lawfulness of the pope's temporal sovereignty, but contended that it was in some sense necessary to the free exercise of his spiritual power, and to the independence of his ecclesiastical government. It was not until the aggression of the French republic upon Rome, and the annexation of the papal provinces called the Legations to the Cisalpine republic, and afterward to the kingdom of Italy, by Bonaparte, that the controversy assumed any practical interest. During the later conflict between Pius VII. and Napoleon I., the design which the latter entertained of a still further annexation of papal territory was one of the main causes of dispute; and still more recently, after the re-annexation of nearly the same portions of the papal states to the kingdom of Italy, the question once more agitated the entire Catholic world. No formal and authoritative judgment of the Roman church was pronounced regarding it; but a strong and almost unanimous expression of opinion was tendered to the late pope, Pius IX., in the form of letters and addresses from the bishops and others in every part of Catholic Christendom. The tenor of all these is nearly the same. They profess that the possession of temporal sovereignty is no essential part of the privileges of the successor of St. Peter; but they also regard the possession of a sovereignty independent of any particular sovereign, as the means providentially established for the protection of the spiritual independence of the pope, and of the free exercise of his functions as spiritual ruler of the church. The contrary opinion held by some distinguished members of the Roman church, although regarded with great disfavor, was not formally condemned by a doctrinal decision, nor was any action taken on it in the Vatican council. The recent annexation of the city of Rome itself to the kingdom of Italy elicited a still stronger expression. The event is noticed in the article **PAPAL STATES** (q.v.).

II. By the second signification of the phrase "temporal power of the pope" is understood what would more properly be called the claim of the pope, in virtue of his office, to a power over the temporalities of other kings and states.

This power may be of two kinds, *directive* and *coercive*. In the first sense, it is a claim which no Catholic, consistently with his belief of the spiritual supremacy of the pontiff, can be supposed to deny, as it imports nothing more than that the pope, as supreme moral teacher, has power to instruct all members of his church, whether subjects or sovereigns, in the moral duties of their several states.

If the power be regarded as coercive, it is necessary to distinguish the nature of the coercion which may be employed. That coercion may either consist in the threat or infliction of *purely spiritual censures*; or it may involve temporal consequences, such as suspension or deprivation of office, forfeiture of the allegiance of subjects, and even liability to the punishment of death. Considered in the former sense, the claim must be regarded as a natural consequence of the spiritual headship of the church, which is acknowledged by all Catholics; nor can it be denied that the power to compel sovereigns, by purely spiritual censures, to the fulfillment of the moral duties which their state imposes, is a natural concomitant of the spiritual primacy.

But the papal claim to authority over the temporalities of kings has gone far beyond these limits. Since the 10th c. popes have claimed and repeatedly exercised a power of coercing kings, and punishing them when refractory by suspension, by deprivation, and by the transfer of the allegiance of their subjects to another sovereign. This well-known claim has been a subject of controversy in the Roman Catholic church between the Gallican (see **GALLICAN CHURCH**) and Ultramontane (q.v.) schools; and in the Ultramontane school, two different theories have been devised for its explanation. The first and most extreme (which holds the power to be a direct one) supposes that this power was given directly by God to St. Peter and his successors, that the two powers are fore-shown by the "two swords" mentioned in Luke xxii. 38, and that the temporal power is a privilege of the primacy by divine law, equally with the spiritual sovereignty itself. According to the second, or *indirect* theory, the temporal power is not directly of divine institution, but is an indirect though necessary consequence of the spiritual supremacy; and is only given as a means of completing, and, in a corrupt and disorganized state rendering more efficacious, the work which the spiritual supremacy is directly instituted to accomplish. It was in this latter form that the theory of the temporal power was defended by the great champion of Ultramontanism, Cardinal Bellarmine, and the celebrated declaration of the Gallican clergy (*Declaratio Cleri Gallicani*) in 1682 (see **GALLICAN CHURCH**) was directed against it.

A third view of the temporal power, and one which has found many modern defenders, was propounded by the celebrated Fenelon (q. v.). According to Fenelon's theory, which is generally described as the historical theory of the temporal power, the pope does not possess, whether by direct divine appointment, or in virtue of the necessities of his spiritual office, any temporal power whatsoever. But he possesses the

plenitude of that spiritual power which is required for the government of the church, and he is empowered to enforce it by spiritual penalties, and especially by excommunication or deprivation of membership of the church. Now, although excommunication and such other penalties, of their own nature, are purely spiritual, yet the religious sentiment of the medieval period, and the awe with which it regarded the authority of the church, invested these penalties with certain temporal effects. See EXCOMMUNICATION.

The penalty of forfeiture of certain civil rights was attached by the law of England, in the case of private persons, to the spiritual censure of excommunication (q. v.). The same penalty was applied by the laws of other countries to the sovereigns themselves; by the law of Spain in the sixth council of Toledo in 638; that of France, as confessed by Charles the Bald in 859; the law of England, under Edward the Confessor, and the so-called Saxon and Swabian codes of Germany. The last-named codes recognize in the pope, in certain specified cases, the right to excommunicate the emperor himself; and ordain that in case the emperor should remain for twelve months without being absolved from the excommunication, he shall be deposed. In the appeal of the Saxon nobles to the pope against Henry IV., this law is expressly referred to. The contemporary historians, Paul of Bernried, Lambert of Aschaffenburg, Nicholas Roselli, and others, describe it as the ground of the emperor's deposition; and even Henry himself, without denying the force of the law, sought his defense solely in a denial of the charge of heresy which was imputed to him. The same spirit of the age is exhibited in the form of oath taken at the coronation of the sovereign in many countries, especially (although not exclusively) in those whose kings—as Roger of Sicily, Peter III. of Aragon, Guiscard of Naples, Godfrey of Jerusalem, and John of England—had made their kingdoms feudatory to the see of Rome; by which the monarch swore to be the protector and defender of the sovereign pontiff and the holy Roman church in all their necessities and utilities, and to guard and maintain their possessions, honors, and rights.

From these and similar indications of the public feeling of the mediæval time, the advocates of this theory of the temporal power infer that orthodoxy and obedience to the pope, in all essential matters of faith and discipline, were by the consent, express or tacit, of sovereigns and of peoples accepted as a condition of the tenure of supreme civil authority—a condition similar in its character and objects to that which forms the basis of the limitation settlement of the succession to the English crown, to the heirs of the princess Sophia of Hanover, “being Protestant.” Hence they conclude that the function really exercised by the popes in relation to heterodox or scandalously immoral sovereigns, or oppressors of the church and church liberties, was in itself a spiritual one, and that the civil consequences which it entailed of deprivation or deposition arose, not from the church law, but from the expressed or understood international civil law of the age. This notion of the origin and nature of the pope's power over sovereigns and states may be regarded as the view now commonly received, and it may help to a better understanding of some points of the controversy regarding the celebrated Syllabus. It may be added, that this view is not confined to Catholic writers, but is held by Leibnitz, Pfeffel, Eichhorn, Voigt, Frederick Hurter (while still a Protestant), and others.

On the other hand, it is difficult, if not impossible, to reconcile this theory with the language used by the popes themselves in enforcing their claim to temporal authority, and with the arguments upon which they rest that claim. Nor can it be denied that whatever is said of the cases of the exercise of such a power which occurred in the 12th and 13th centuries, the power continued to be claimed and to be exercised down to and even after the reformation, when it would be idle to suppose that any such public understanding, if it had existed in the middle ages, had not been revoked, if not by all, at least by those nations which had revolted from the Roman church.

The history of most of the principal instances of the exercise of this power by the popes, will be found detailed under the separate articles which refer to the particular popes or sovereigns who engaged in the contest of church and state.—See Gosselin's *Pouvoir du Pape au Moyen Age*.

TENACITY (Lat. *tenacitas*, power of holding) is that property of material bodies by which their parts resist a force employed to attempt to separate them. It is the result of the attractive forces exerted by the particles of matter upon one another through the infinitesimally small spaces which are supposed to exist between them; hence it differs in different materials, and even in the same material at different degrees of temperature. The practical bearings of the tenacity of solids (especially of wood and iron) are discussed in the article **STRENGTH OF MATERIALS**; and we shall therefore here only state a few of the conclusions at which Muschenbroek and other experimentalists have arrived regarding the modifications which the tenacity of metals undergoes in consequence of various processes. Forging and wire-drawing increase the tenacity of metals in longitudinal direction. Copper and iron have this property more than doubled, while gold and silver have it more than trebled by these metals being drawn into wire. Mixed metals have usually a greater tenacity than simple ones. See **ALLOY**.

TENAILLE, in fortification (q. v.), a work in low relief, constructed immediately in front of the curtain. It may either have two faces, in a line with the faces of the adjoining bastions, and meeting at the center in a re-entering angle; or three faces, of which two are prolongations of the bastion faces, and one parallel to the curtain. The tenaille

must be low enough for the defenders to be safe from the musketry-fire on one bastion defending a breach in the other bastion. This work protects the ditch, covers the postern from the enemy's view, etc. See *illus.*, FORTIFICATION, vol. VI.

TENANCY AT WILL, in point of law, means an occupation by a person in the character of a tenant, but for no fixed term other than the will or caprice of the landlord or proprietor. In general, courts are averse to assume a tenant to be a tenant at will, if there are materials to satisfy the description of a yearly tenant. Rent is payable, under a tenancy at will, according to the time of occupation, and the tenancy can be determined by either party at any time. But the tenant is not to be prejudiced by the sudden determination of the tenancy, so that if he has sown the lands, he is entitled afterward to re-enter the lands, to reap the crops; and, in like manner, he has a reasonable time to remove his furniture.

TENANCY IN COMMON, in point of law, means a right to hold or occupy lands, or possess chattels, along with another or other persons. In such a case, each has an equal interest; but in the event of the death of either, his share does not go to the survivors, as is the case in joint tenancy (*q. v.*), but to his heirs or executors. Tenancy in common applies to ownership as well as leasehold interests. Though each tenant has as much right to the whole property as the others, yet neither has a definite share set apart to himself exclusively. If one wastes or deals with the property to a greater extent than his share, the others can bring an action against him. Each can at any time compel a severance of the property. The undivided interests held by tenants in common need not be acquired at the same time or by the same title by all the tenants, and they need not be the same in amount. The share of each tenant is subject to his debts, and to dower and courtesy. His power over it is absolute. He may make a conveyance of it, devise it by will, or encumber it by mortgage. In most of the states the common law rule has been so changed by statute that what would be a joint tenancy in England is in this country a tenancy in common; so that persons who take land in undivided shares by will or deed are tenants in common. A tenant in common can always compel partition. See PARTITION.

TENANCY ON SUFFERANCE differs from a tenancy at will in this, that a tenant at will enters on a good title, whereas a tenant on sufferance has no title, and wrongfully continues. Thus, when the term has ended, and the tenant has got notice to quit, but does not, he continues a tenant on sufferance, and may be ejected at any time, unless the landlord elect to treat him as a tenant in continuation of the former lease.

TENANT FOR LIFE, in English law, means one who has not the absolute property, but an interest in the property, which ceases with his own life, or the life of another. An estate for life in lands is classed with freehold estates. Where the estate for life depends on the life of a third person, as it is the interest of the tenant that such third person should live as long as possible, frauds are often committed on the reversioner by misrepresenting the fact of such person being alive; hence, to prevent fraud, the reversioner may insist on the third person being produced, failing which he will be taken to be dead. An estate for life is usually created by deed, but there are two legal estates for life—namely, the widow's estate in dower, and the husband's estate by courtesy on his wife's death. As a general rule, a tenant for life of real estate is entitled to take wood to repair and burn in the mansion of the estate; but he cannot for other purposes fell the trees, nor open mines or pits, though, if these have been already opened, he may carry them on. Sometimes a tenant for life is declared by the deed or will to be tenant without impeachment of waste, in which case he can exercise most of the rights of an absolute owner, except cutting down ornamental timber, or defacing the family mansion. Tenants for life may now apply to the court of chancery for leave to raise money to drain the lands and make improvements. When a tenant for life dies between the usual terms for drawing rent, the rent is apportioned between his executors and the party next entitled. A tenant for life is called, in the law of Scotland, a life-renter. See FEE AND LIFE RENT.

TENANT IN FEE SIMPLE, in English law, is the old feudal description of one who is absolute owner, the fiction being that all were originally tenants of the crown. A tenant in fee simple has a freehold estate of inheritance, which is the highest degree of property known to the law. There is practically no feudal connection with the crown, and he can alienate or devise the property without the leave or sanction of the crown. A tenant in fee simple has an absolute right to the soil and the mines down to the center of the earth, and has a right to build as high as he pleases. If he dies, the estate goes to his heirs, *i. e.*, his heirs general; but he has power to devise it to whom he pleases, subject to certain restrictions, in cases where the donee is a charitable corporation or trustee for charitable purposes. See MORTMAIN. A tenant in fee simple is called, in the law of Scotland, a *fiar* (*q. v.*).

TENANT IN TAIL. See TAIL, ESTATE.

TENANT-RIGHT. This term is used by tenants to denote the various claims of right which they may maintain against their landlords, such as the right of occupancy not subject to removal; and the right to occupy at a rent not subject to increase on the ground of improvements; it being said to be inequitable to make

them pay rent for what they have themselves produced. It is in Ireland that the claims have always had most importance. In Ulster, and in the north of Ireland generally, the equity of them has long been recognized and acted upon. In the south of Ireland, on the other hand, tenant-right was never conceded by the proprietors; while the right of occupancy not subject to removal, has, *de facto*, been enjoyed by the tenants. The non-settlement of the question was long the cause of bitter controversy, and undoubtedly its evil condition was the root of much of the national misery. Owing to the old tenure of land as tribal or clan property, the people of the south of Ireland never received into their minds the notion of "contracting" with any one as the "owner" of land. They had the traditional feeling of being themselves the owners; and so much was this feeling a source of agrarian disturbances, that few Irish "landed proprietors" have ever ventured fully to exercise their rights of property. And nothing was more common in the south than to find that the land had been in the occupancy of the same families from time immemorial without lease or contract of any kind.

By the Land act of 1870 the Ulster tenant-right custom and all corresponding customs received the force of law, and when there was no definite custom, the outgoing tenant became entitled to compensation from the landlord to an amount varying from one to seven years' rent. The Land act (Ireland) of 1881 makes most beneficial changes in the position of Irish tenant farmers. A Land commission or court (with sub-courts throughout the country) was established, to which every tenant may have recourse in order to have a "judicial" rent fixed for a period of 15 years, at the end of which time the tenant may again apply to the court. During the 15 years the tenant cannot be evicted save for the breach of certain conditions, on non-payment of rent, and the rent cannot of course be raised. The tenant's right to sell his tenancy to one person at the best price he can get was recognized; and provision was made for advancing money to tenants willing to purchase their holdings absolutely.

The Irish claim of tenant-right very much resembles that made by the Indian ryots against their zemindars. In India, as in Ireland, until what may be called recent times, land belonged to families or communities, which held themselves to be composed of kindred; but by acts passed by our government, a class of mere tax-collectors have been converted into land-owners, in order to facilitate the collection of the revenue. Hence, there has been in India an agitation very much resembling that which prevailed in the south of Ireland. The ryot claim of tenant-right was made the subject of a suit before the supreme courts of India, when a majority of the judges favored the equitable claim of the ryots. In countries where the people have been trained in notions derived from the Roman or feudal laws, there has been little heard of this species of claim of right, and land has been recognized by the people as being, like other things, a fair subject for contract.

In Scotland and in the north of England farms are almost always let on long leases, and at such rents as are supposed to repay the tenant the capital which he may lay out in improvements; and the common case is, that the landlord binds himself to pay the tenant a stipulated sum as the value of his improvements, provided that these are found at the end of the lease to be of a certain stipulated value. Over England generally, on the other hand, tenancy can be ended by six months' notice on either side, and the evils incidental to this precarious tenure have been obviated or mitigated solely by the honorable conduct of the English proprietors. It is quite common in England to find that the son has succeeded the father as tenant-at will for many generations, often for centuries.

Since the admission of the claim to tenant-right in Ireland, it has been more frequently heard of in the other parts of the United Kingdom, especially in the form of a claim to compensation for permanent or unexhausted improvements made by the tenant. Of the equity of this claim there can be no doubt, and the Agricultural Holdings act of 1883 (see LANDLORD AND TENANT) in some measure recognized the British farmer's right to compensation in such cases. Without this, the law by which the ownership of improvement follows the ownership of land, is in the present condition of things in the highest degree unjust and inexpedient. The tenant's interest in all his improvements ending with his tenancy, he is very unlikely, at least toward the end of his term, to spend anything on the land which will be of benefit to it; and where he is a tenant-at-will, he is entirely without interest to improve it.

TENAS'SERIM, acquired by Britain after the war in 1825, is the third or southernmost division of British Burmah* (q.v.)—the other two divisions comprising the ancient kingdoms of Pegu and Aracan. On Jan. 31, 1862, these three maritime provinces were united under one local administration. Pegu has since been subdivided.

Tenasserim is a narrow line of coast about 500 m. in length, with a varying breadth of from 40 m. at its southern extremity to 80 m.; the latter distance being measured from the sea-shore at the mouth of the Salwen to the range of mountains on the e. that separates Tenasserim from Siam. It extends lengthwise from the southern

*The provinces of British Burmah extend along the eastern shore of the bay of Bengal from the Naf estuary, in about 20° 50' n. lat. to the Pak-chan river, in about 10° 15', with a coast-line of 900 English miles. Their area and population, according to the returns of 1891, are as follows: Aracan, area 14,526 sq. m., pop. 672,000; Pegu, area 9299 sq. m., pop. 1,456,000; Tenasserim, area 46,590 sq. m., pop. 978,000; Irrawadi, 17,542 sq. m., pop. 11,552,000.

border of Pegu in $17^{\circ} 50'$ n. lat. to near the tenth parallel of n. lat., and from $97^{\circ} 30'$ to $99^{\circ} 36'$ e. long., and has a total area of 46,730 sq. miles. Tenasserim is divided into six administrative districts, besides the town of Moulmein: Toungu, area 6,354 sq.m.; Schwe-gyen, 5,567 sq.m.; Salwen, 4,646 sq.m.; Amherst, 15,193 sq.m.; the town of Moulmein, 10 sq.m.; Tavoy, 7,200 sq.m.; and Mergui, 7,760. The principal town is Moulmein, the next in importance being Toungu and Mergui.

Physical Features.—The general aspect of the country is bold and picturesque. The numerous wooded ranges of hills take generally a course from n. to south. The northern part of the country is the most level; the southern portion is little else than a wilderness of thickly-wooded hills, inclosing long and narrow valleys. The soil of the plains is very fertile, and suited to the growth of rice, indigo, cotton, sugar, and vegetables. Tobacco grows chiefly on the banks of rivers in the hills. Only about $\frac{1}{15}$ of the country is under cultivation, and the forests occupy two-thirds of the entire area. The chief rivers are the Salwen, Gyne, Attaran, Yé, Tavoy, and Tenasserim. The Tenasserim, from which the country derives its name, is the most considerable river of the province. The principal ports of Tenasserim are Moulmein (q.v.), Amherst, Tavoy, and Mergui, of which Moulmein is the best. Amherst harbor, at the mouth of the Salwen, affords good anchorage for ships of any draught of water, but is difficult of approach. The Mergui archipelago, lying off the southern coast of Tenasserim, consists of almost innumerable islets, some of which are said to be rich in iron ore; and they are famous for their edible birds' nests. Numerous anchorages are found among the islands. The country possesses vast stores of mineral wealth, which now lie absolutely neglected. Gold-washing has been pursued with success at the head of the Tavoy river. At Kahan, on Mergui island, are rich and accessible tin-mines; and thousands of tons of good clean ore, yielding 75 per cent of the pure metal, could be raised not far from the surface of the ground. A very productive iron ore is obtained from Iron island, between Tavoy and Tiger island. Mergui province furnishes a valuable lead ore, and has extensive fields of coal. Manganese has been found on the Tenasserim river, where it is believed to be very plentiful.

Botany.—The botanical productions of Tenasserim may vie with those of any part of the world. There are more than one hundred different kinds of timber-trees, of which the teak is the most important. The celebrated *Amherstia nobilis* is the most splendid of the many flowering and ornamental trees for which Tenasserim is famous. The palm tribe are in great variety, and Dr. Griffith collected 1700 different species of plants in about 14 months.

The climate of Tenasserim is regulated by the monsoons; and the wet and dry seasons divide the year into two nearly equal parts. The average yearly fall of rain is about 194.28 inches, and this descends during the six rainy months from May to October. The greatest amount of rain ever recorded as having fallen in one day (May 27, 1857) is 12.78 inches; and the gauge for the week registered 40.27 inches (Dr. Walter). While the rains last, the temperature is very uniform, the thermometer ranging between 76° and 82° . The cool season lasts from the cessation of the rains in October, when the north-east monsoon begins, to the middle of February. During that time, the thermometer seldom reaches 90° in the shade, and occasionally falls at low as 56° , and now occurs the greatest thermometric range, which is sometimes as much as 30° in one day. The sun then gradually regains its power, and the heat increases daily till the south-west monsoon again brings clouds and rain. In the hot period, the thermometer at mid-day is not often below 92° in the shade, and not unfrequently stands at 95° .

Commerce.—The principal exports from Tenasserim are teak, timber, and rice. The trade of the province is, however, not on the increase. The first two articles of export mentioned are not continuous from year to year; and we accordingly find that the decrease in the value of trade is owing to the diminished demand for teak timber. Indeed the defective continuity of supply is to some extent a fact also as regards timber. Rice is the most reliable article of commerce.

Inhabitants.—In 1891 the pop. of the Tenasserim districts was as follows: Toungu, 162,000; Schwe-gyen, 199,000; Salwen, 31,000; Amherst, 417,000; Tavoy, 94,000; Mergui, 74,000; total pop. of Tenasserim, 978,000. Most are Burmans proper, but there are other races, as Talaings, or descendants of the ancient Peguans; Karens, a dispersed people, inhabiting secluded mountain districts—among whom Christianity has made some progress, through the labors of American missionaries; Touthoos, Khyengs, Shans, Europeans and their descendants, Chinese and Indians. Throughout Tenasserim and British Burmah generally, inheritance and marriage are regulated by Buddhist law, while at the seaports the English mercantile law and law of contracts are in force, and regulate the decisions of the courts.—*The Natural Productions of Burmah and the Tenasserim Provinces*, by the Rev. F. Mason, A.M. (Moulmein, 1850); *Six Months in British Burmah*, by Christ. T. Winter (Lond., 1858); Phayre, *History of Burma* (1883); Murray, *Handbook for Travellers in India, Ceylon, and Burma* (1895); Yoe, *The Burman, his Life and Notions* (2nd ed., 1896).

TENBY, a small parliamentary and municipal borough, and thriving watering-place, of South Wales, in the county of Pembroke, and 10 m. e. of the town of that name. Its charming situation on a peninsula, overlooking the bay of Caermarthen, its salubrity of climate, and the facilities for bathing which the extensive sands in the vicinity afford,

have made it a popular watering-place. A considerable part of the ancient embattled walls of the town still remains. There are also a handsome church and picturesque ruins of a castle. The season lasts from June till October. Fishing is extensively carried on, and some coal is mined in the vicinity. Pop. '91, 4542, but during the summer the number is greatly increased.

TENCH, *Tinca*, a genus of fishes of the family *cyprinidæ*, of a thick form, with small scales, and a barbel at each side of the mouth, the teeth on the pharynx compressed and club-shaped. The COMMON TENCH (*T. vulgaris*) is an inhabitant of ponds and other stagnant waters in Europe and the north of Asia. It passes the winter in a torpid state, concealed in the mud. It is of a deep yellowish-brown color, more rarely golden or greenish. Instances have occurred of its attaining a length of 3 ft., but a tench of half that length is unusually large. It is very tenacious of life, and, like the carp, can be conveyed to a distance alive in wet moss. It spawns in May and June, depositing its spawn among aquatic plants. The ova are very small and very numerous. The flesh of the tench is soft and insipid, except when it is very well fed, when it becomes delicate and pleasant. It is commonly placed in ponds along with carp; a much smaller number of tench than a carp, however, being deemed sufficient to stock a pond. In Britain, the tench is found only in England, and there sparingly in some of the slow and muddy rivers. It is not improbable that it may have been originally introduced as a pond-fish, although it has long been naturalized. Angling for tench resembles angling for carp. The same kinds of bait are used.

TENCIN, CLAUDINE ALEXANDRINE GUÉRIN DE, 1681-1749; b. Paris; at first a nun; absolved from her vows in 1714. She lived in Paris with her brother, afterward cardinal, where she gained riches out of John Law's schemes. She was the mistress of cardinal Dubois, of the regent, d'Argenson, Bolingbroke, and other eminent men; and was the mother of D'Alembert by the poet Destouches. She took an active part in the Jansenist controversy. She was arrested, but acquitted, in 1726, on the charge of having endeavored to make away with La Fresnay, one of her numerous admirers, who had committed suicide at her house. After her release she became a conspicuous figure in society, and her salon was the rendezvous for fashionable and literary people. She was the friend of Fontenelle, Montesquieu, and other literary men. Among her works are: *Le Siège de Calais*, an historical novel (1739-40); and *Les Malheurs de l'Amour* (1747). See *Œuvres de Mesdames de Fontaines et de Tencin*, edited by Garnier (Paris, 1864).

TENDA, COL DE, a pass over the Maritime Alps. See ALPS.

TENDER, as a legal term, means the formal offer to perform some obligation incumbent on the person tendering. It is more frequently used in reference to the payment of money due. See MONEY. When a tender of the debt is properly made, the legal consequence is this, that if the money is refused, the creditor will have to pay the costs of any action he may bring to recover it, and cannot claim interest afterward. In case such an action is brought, the debtor has nothing to do but to plead that he duly tendered the money, and if he then pay into court the sum which he had formerly tendered, the other party must stop the action, or continue it at his own risk. In order, however, that a tender should have the above effect, it must have been duly made—that is to say, it must have been made without imposing any conditions on the creditor, and at the proper time and place. The tender must be in money, and not by bill of exchange; and the paper money of the U. S. government and the national banks are legal tender for any sum. A formal tender of a larger sum than is due is good, but must not require change to be given, which the creditor is not obliged to find. Nor must any condition be annexed to the tender, not even the condition of giving a regular receipt, though on other grounds, by statute, a person receiving payment is bound to fill up a regular receipt on its being tendered to him, and to sign the same. A tender must, in general, be made to the creditor at the place he has indicated, and it is the duty of the debtor to find out and pay the creditor. With regard to payment of rent, however, it is enough that the tenant be ready to pay the rent on the premises at the time it is due, it being the landlord's duty to send or call for it, for the land is the proper debtor, and that is the place to apply to in the first instance. The silver coins of the United States of smaller denominations than \$1.00 are legal tender in sums not exceeding \$10. The nickel and copper coins are legal tender only to the amount of 25 cts. The silver "trade dollar" is not a legal tender.

TENDER, in naval language, a small vessel appointed for the service of a larger one. Steam gunboats are most commonly employed as tenders.

TEN DON is a term employed in anatomy to designate the white fibrous tissue reaching from the end of a muscle to bone or some other structure which is to serve as a fixed attachment for it, or which it is intended to move. In accordance with their form, tendons have been divided into the three following varieties: (1) *Funicular*, or rope-like, as the long tendon of the biceps muscle of the arm; (2) *Fascicular*, as the short tendon of that muscle, and as the great majority of tendons generally; and (3) *Aponeurotic*, or tendinous expansions, sometimes of considerable extent, and serviceable in strengthening the walls of cavities, as, for example, the tendons of the abdominal muscles.

The tendons commence by separate fascicles from the end of each muscular fiber,

and they similarly terminate by separate fascicles in distinct depressions in the bones, besides being closely incorporated with the periosteum. In some birds, whose tendons are black, the periosteum is black also, from this incorporation. If a tendon is ruptured by an accident, or divided by the surgeon, the two ends, if not too far separated, unite with extreme readiness, by the formation of intervening plastic material, which soon acquires great firmness. So rapidly is this process of repair carried on, that, according to Mr. Paget, a specimen, six days after division, could bear the weight of 25 lbs.; while in another specimen, the new material, at the end of 21 days, bore a weight of 56 lbs. When the interval between the two ends of a tendon exceeds a certain limit, there will be only an imperfect bond of union, and either a partial or total loss of the use of the muscle will result. For details regarding this process of repair, which has an intimate bearing on the treatment of ruptured tendons, the reader is referred to Mr. Paget's admirable *Lectures on Surgical Pathology*.

Among the diseases of tendons, *inflammation* requires especial notice. "Tendons," says Mr. Tatum, in his article upon *Affections of the Muscular System*, "together with their sheaths, are not unfrequently inflamed. Independently of gout and rheumatism, the most frequent cause is a sprain or wrench in the neighborhood of a joint. These injuries are occasionally productive of long-continued wearing pains, assuming much of a rheumatic character, and yield often slowly and unwillingly to the remedies, both local and general, employed in rheumatism."—Holmes's *System of Surgery*, vol. iii. p. 544. In one of the forms of whitlow (q.v.), known as *paronychia gravis*, or *tendinous whitlow*, "the tendons and their sheaths in the finger and hand are the seat of a severe and often most destructive inflammation, which, though often confined to one finger, not unfrequently extends to the hand and arm, attacking not only the tendons and softer parts, but exposing the bones, and disorganizing the joints."—*Op. cit.*, p. 544. It arises from slight punctures or wounds, with or without the inoculation of irritant or poisonous matter, and often without any apparent cause, except a derangement of the general health. It begins with severe and throbbing pain in the palmar surface of a finger, which extends upward along the arm. There is extreme tenderness, and a certain amount of redness and swelling, with great tenseness of the parts. If the inflammation is not checked, suppuration soon ensues, accompanied by much constitutional disturbance. The matter frequently extends among the muscles, and in bad cases occurring in unhealthy persons, the bones and joints became affected in the way already mentioned. In the early stage, free leeching, followed by hot fomentations, may be useful. The hand should be kept elevated, and an active purgative, with low diet, prescribed. If, as is often the case, these measures are unsuccessful, a free incision must be made along the center of the palmar aspect of the finger—an operation which gives extreme relief, by removing the tension, and allowing the escape of blood, even if little or no pus is discharged. A generous diet, stimulants, and tonics, are now advisable; and under this treatment the disease generally yields; although cases occasionally present themselves in which the suppuration produces such results as to render amputation of the arm necessary, or even to cause death. A permanently bent finger, from adhesion of the tendon to its sheath, is a common result in severe cases of whitlow of this kind.

Tendons are not very unfrequently the seat of syphilitic enlargements or tumors. Malignant tumors scarcely ever spring from tendons, but fibrous tumors and small cartilaginous enlargements are often found in tendons.

Rupture of the tendons is an accident which is frequently caused by violent muscular action, especially if, from illness or other causes, the muscles have been for some time in a state of inactivity. The long tendon of the biceps cubiti is very obnoxious to this injury, which, in this case, is more often due to the disorganization caused by chronic rheumatic gout than to mere mechanical violence. The other tendons most frequently ruptured are the tendo Achillis, and the tendons of the rectus femoris and the triceps humeri. When a tendon is ruptured or divided by a surgical operation (tenotomy), "the part which is attached to the muscle is drawn away from the opposite end for about an inch. Blood is poured out between the ends, but much less than in rupture of muscles. The pain is said not to be very great; a considerable shock, however, is felt, as from a blow received on the part, accompanied by cramp of the muscle, and a perfect inability to use the limb; and in rupture of the tendo Achillis, a feeling is described as if the heel were sinking into a hole in the floor."—Holmes's *System of Surgery*, vol. iii. p. 541. The essential point in the treatment of ruptured tendon is to keep the injured part in a state of constant rest and muscular relaxation, so that the separated ends may be approximated as much as possible, and to prevent any violent extension till firm union, by the process of reparation, has been established. The special methods of treating individual cases (as rupture of the tendons of the rectus femoris and the triceps, and of the tendo Achillis) are discussed in Holmes's *System of Surgery*, and other standard works on surgery.

TENEBRÆ (darkness), a service in the Roman Catholic Church appointed for Wednesday, Thursday, and Friday of Holy Week. The name is taken from the opening of the Responsorium following the fifth lesson on Good Friday, *Tenebræ factæ Sunt*. The service consists of sixteen Psalms and a Canticle from the old Testament, sung with their proper Antiphons in fourteen divisions, nine Lessons, nine Responsories, the Canticle, *Benedictus Dominus Deus Israel*, and the Miserere. Most of the service is in

unisonous Plain Chant. At the conclusion of each Psalm and Antiphon one of the fifteen candles in the immense triangular candlestick is extinguished with ceremony. During the singing of the Benedictus the six altar candles are put out one by one. The only light remaining is the candle at the apex of the candlestick. This is removed and carried behind the altar. A solo soprano sings the Antiphon, *Christus factus est pro nobis obediens usque ad mortem*. A silence follows, during which the Paternoster is whispered in secret, and soon after the Miserere begins pianissimo, swelling into a cry for mercy. A prayer is made and the candle is brought from behind the altar.

TENE BRIO. See MEAL-WORM.

TENEDOS (Turk. *Bogdsha-Adassi*), an island belonging to Turkey in the n.e. of the Ægean sea, off the coast of the Troad, and about 17 m. s. of the western entrance to the strait of the Dardanelles. It is about 5 m. long by 2 broad, rocky, but not unproductive, with a pop. of, '88, 4140, who are partly Greeks and partly Turks. The chief t., also Tenedos, or *Bogdsha*, has a trade in wine. Opposite Tenedos, on the coast of Asia Minor, is the bay of Besika.

TENEMENT, in the strict legal sense, includes everything of a permanent nature that may be an object of tenure, whether corporeal or incorporeal. The phrase *liberum tenementum*, or freehold, is thus applicable to offices and rents as well as to real estate. The term tenement took its origin in the feudal system, where all lands were held on condition of pecuniary or military service to a feudal lord; and the real estate or incorporeal hereditament became known as the *holding*, or *tenement*. The common use of the word to denote leased or rented houses is derived from the fact that such property was always occupied by tenants rather than by owners in fee. It is now very generally used to indicate rooms let within a building devoted to that purpose.

TENEMENT HOUSES. A tenement house is legally defined as a house occupied by more than three families, living independently, and doing their own cooking on the premises, or by more than two families on a floor, so living and cooking, and having a common right in the halls, stairways, yards, etc. This definition, however, might be made to cover many apartment-houses or flats: tenement houses, commonly speaking, are the poorest class of apartment-houses; they are generally poorly built, without sufficient accommodations for light and ventilation, and overcrowded; the middle rooms often receive no daylight, and it is no uncommon thing for several families to be crowded into one of these dark and unwholesome rooms. Bad air, want of sunlight, and filthy surroundings work the physical ruin of the wretched tenants, while their mental and moral condition is equally lowered. Attempts to reform the evils of tenement life have been going on for some time in many of the great cities of the world; for not only does the wretched condition of the tenants awake sympathy, but the filthy houses are found to be producers of diseases which menace the health of the entire community. In London, where the evils exist to an alarming extent, an earnest reformer, Miss Octavia Hill, has done excellent work of late years, by gradually educating tenants in some of the worst courts of the city to better habits; and she has been enabled by subscriptions to purchase some of the tenement houses, which under her management have been greatly improved. In the U. S., active reform measures have been lately begun in several of the large cities. Tenement houses were erected in New York first abt. 50 years ago. In Philadelphia, Brooklyn, and a few other large cities the bulk of the population still live in single dwellings, but in many American cities the flat system has been adopted—the result of rapid growth of population and increased value of real estate—and large tenement houses have been built accommodating from one to eight families on a floor. It is estimated that one fourth of the entire pop. of the U. S. now lives in cities, and this proportion is increasing. Earnest efforts were made to better the condition of tenement houses and their inmates in New York, 1879, when public attention was vigorously called to the subject by pulpit and press. In that city there is a greater overcrowding of human beings in comparison to the space occupied than has ever been known in any civilized country. Investigations revealed shocking details of tenement life. The N. Y. sanitary Reform Assoc. was organized, especially for reforming the evils of tenement life; and an act was passed, 1879, limiting the space to be occupied by any tenement house to 65 per cent. of the lot pertaining to it, requiring all bedrooms to have windows with direct light and air, and greatly increasing the power of the board of health to remedy the abuses in such buildings. Two associations were formed to build improved tenement houses; and houses for this purpose can now be erected only after the plans have been approved by the Board of Health. In other cities, notably Boston and Chicago, sweeping reforms have been carried out.

TENERA NI, PIETRO, 1789–1869; studied sculpture with Thorwaldsen and Canova at Rome. Among his more famous works are the "Angel of the Last Judgment;" the sarcophagus of Pius VIII. for St. Peter's; "Christ on the Cross," at St. Stephen's in Pisa; and "Flora," now owned by Queen Victoria. He was professor at the Academy of St. Luke, and in 1860 director of Roman museums. His works include a large number of groups, single statues and busts, many of which are remarkable for their beauty and lifelike appearance. Besides the works already mentioned, he executed a fine marble relief of the taking from the cross in the Torlonia chapel in the Lateran, and the relief for the tomb of the Countess of Lante.

TENERIFFE, the largest of the Canaries (q. v.).

TENERIFFE, **PEAK OF**, or **PICO DE TEYDE**, a famous dormant volcano, the highest summit in the Canary islands, stands in the s. w. of the island of its own name, and is 12,182 ft. above sea-level. The middle regions of the mountain are covered with forests, the base, as well as the valley and surrounding hills, covered with vineyards of olives and almonds, orange and fig trees; but the upper ridges, and the peak, properly so called, are wild, barren, and rugged in appearance. The peak and its two inferior neighbors—the *Montaña Blanca* and *Chajorra*—rise from a rugged circular plain of lava debris and pumice, 7000 ft. above sea-level, about 8 m. in diameter, and fenced in on all sides by an almost perpendicular wall of rock. From the crevices of these mountains sulphurous vapors are constantly exhaling. The peak can be seen from a distance of upward of 100 m.; but the view from it is generally destroyed by the dense masses of cloud which hang over the surrounding sea at an average elevation of 4,000 to 5,000 ft., the sky above being almost uniformly clear and bright. Mr. Piazza Smyth, in the summer and autumn of 1856, made here a series of experiments for the purpose of ascertaining how far astronomical observation could be improved by eliminating the lower third part of the atmosphere, and with this object observed for two months, first on Guajara (an elevated peak of the rocky wall, 8,903 ft. high), and afterward on Alta-Vista (on the side of the peak, 10,702 ft. high). See *Teneriffe*, by C. Piazza Smyth (London 1858).

TENESMUS (from the Gr. *teinein*, to strain), is the term employed in medicine to designate a straining and painful effort to relieve the bowels when no fecal matter is present in the rectum; the effort being excited by some adjacent source of irritation. All that is got rid of by the straining, which usually occasions more or less descent of the gut, is mucus, frequently stained with blood. Tenesmus is a common symptom in dysentery, irritation of the bladder, stricture of the urethra, etc.

TENIERS, **DAVID**, the elder, a Flemish artist of note, was born at Antwerp in 1582. For some years he was a pupil of Reubens; afterward, he visited Italy, where he studied under Adam Elzheimer, and, on his return, settled in his native city, where he died in 1649. The subjects of Teniers's pencil are, in general, very homely, and often low—the interiors and exteriors of public-houses, smoking-rooms, rustic games, weddings, etc.; but they are executed in the most vividly realistic manner, with such charm of color, and happy ease of composition, that they never fail to excite in the beholder a lively sense of pleasure. Teniers was almost constantly employed during his career as an artist.

TENIERS, **DAVID**, the younger, son of the preceding, was born in Antwerp, Dec. 15, 1610. He received his first lessons in art from his father, and appears to have learned much from study of the works of Adrian Brauer. He early exhibited works surpassing those of his father, and in 1632 was admitted as a master in the guild of St. Luke, where his name was inscribed on its ledger as "Tenier," a signature found on a number of his early paintings. In 1637 he married Anne Breughel, daughter of John (Velvet) Breughel, and in 1644 was chosen by the Common Council of Antwerp to preside over the guild of painters. About this time he was commissioned by the guild of St. George, to paint a picture which is now in the Hermitage Gallery in St. Petersburg—"The Jubilee Meeting of the Civic Guards." Among his many friends and patrons during his lifetime, were the King of Spain, who had, it is said, a whole gallery filled with the works of Teniers, Queen Christina of Sweden, the Prince of Orange, and the Bishop of Ghent, but his special patron was the Austrian Archduke Leopold William, governor of the Spanish Netherlands, who appointed Teniers gentleman of his bed-chamber and keeper of a collection of pictures he was forming. Up to this time Teniers had resided chiefly in the outskirts of Malines, where he had found numberless subjects for his canvases. In 1647 he removed to Brussels, assuming by the archduke's orders the rank and title of "Ayuda de Camara." Continuing his individual work, he also traveled for the archduke, visiting London, among other cities. Leopold's successor, Don John, was equally appreciative of the great artist, and also studied under him. The wife of Teniers died in 1656, and he married Isabella de Fren, the daughter of a councilor at the court of Brabant. Eager to be ranked among the nobility he petitioned the king for advancement to knighthood, Rubens and Van Dyck having already received that honor, but the monarch refused to grant it so long as Teniers continued to sell his work. Failing in this he acquired greater and lasting renown by founding at Antwerp an Academy of Fine Arts, and obtaining for it a royal charter in 1663. Teniers died in Brussels, Apr. 25, 1690; of his children, David, the eldest (d. 1685) attained celebrity, and a daughter Cornelia married an artist of note, John Erasmus Quellin (1634-1715).

Teniers founded no school, and only one of his scholars, Van Tilborgh, was successful as an imitator. He was a very rapid painter and fully 700 of his pictures have been described. They are scattered through the galleries of England and the continent, and include a large picture of resting pilgrims in the National Gallery in London, "Peter Denying his Master," in the Louvre, and several life-sized portraits in the Doria Pamphili Gallery in Rome. He painted marine views and animals, to some extent, but his pictures chiefly represent country life: peasants disposed in cottages or taverns, or enjoy-

ing themselves out of doors, and in open air scenes he excelled, his skies and landscapes being very luminous and beautiful. In etching he was equally facile. The best works in the Archduke Leopold William's collection were reproduced by him with the needle, and more than 500 plates were made from his own paintings. His genius found additional means of expression in some designs for the tapestry looms of Brussels.

TENIMBER ISLANDS. See TIMORLAUT.

TENNANT, DOROTHY. See STANLEY, HENRY M.

TENNANT, WILLIAM, still to be remembered as the author of *Anster Fair*, was born at Anstruther, in Fife, in the year 1784. A cripple almost from his birth, and doomed to propel himself through life on crutches, he betook himself naturally to study, as requiring no exertion of the limbs. In 1799 he went to the neighboring university of St. Andrews where, however, he only remained two years, leaving it to join his brother, a corn-agent, in business. In this his success was indifferent; and in 1812 he was fain to accept the situation of parish school-master at Denino, a small hamlet about 4 m. from St. Andrews, with a salary of £40 a year. The same year, he had published his *Anster Fair*, a poem of much sprightliness and humor, notable as the first attempt to naturalize in our language the gay *ottava rima* of the Italians; by Byron, soon after adopted with such splendid success in his *Beppo* and *Don Juan*. The piece gradually made its way, and in 1814 a highly laudatory notice of it appeared in the *Edinburgh Review*, from the pen of the then omnipotent Jeffrey. In 1816 Mr. Tennant became teacher of a school at Lasswade, near Edinburgh, whence three years afterward, he transferred his services to the academy of Dollar in Clackmannanshire. His attainments as a linguist were extraordinary; and in 1834 he was appointed professor of oriental languages in the university of St. Andrews—a post for which, perhaps, not many men then living had similar qualifications. In connection with his new duties, he published, in 1840, grammars of the Syriac and Chaldee languages. He died Feb. 15, 1848, at his residence near Dollar, where his summers were usually spent. He was one of the most genial and amiable of men. Besides other miscellanies in verse, he gave to the world, in 1822, *The Thane of Fife, a Poem*; in 1823, *Cardinal Beaton, a Tragedy*; and in 1825, *John Balliol, a Drama*. None of these later productions had much success, or did anything to increase the literary reputation which his first work had won for him.

TENNENT, GILBERT, 1703–64; b. Ireland; came to America with his father, 1718, and aided him in an academy in Philadelphia; studied medicine and theology; was ordained pastor of a Presbyterian church in New Brunswick, N. J., 1726, continuing the connection until 1743, though traveling and preaching with Whitefield in New England for several months; founded and became pastor of a church in Philadelphia, with which he remained connected until his death. In 1851 he visited England with president Davies to obtain aid for the college of New Jersey. He published *Lawfulness of Defensive War; Sermons on Important Subjects*.

TENNENT, Sir JAMES EMERSON, LL.D., 1804–69; b. Ireland; educated at Trinity college, Dublin, and called to the bar. He was a member of parliament, 1832–45; secretary to the India board, 1841–45; and civil secretary to the Ceylon colonial government, 1845–50. He was again elected to parliament in 1852, was secretary of the poor law board the same year, and a joint secretary of the board of trade, 1852–67, when he was made a baronet. Under his original name of Emerson (Tennent being added on his coming into the estates of his wife, a daughter of William Tennent), he published *A Picture of Greece in 1825* (1826); *Letters from the Aegean* (1829); and *History of Modern Greece* (1830–45). Among his later works are *Christianity in Ceylon* (1850); *Account of Ceylon* (1859); *Sketches of the Natural History of Ceylon* (1861); and *The Story of the Guns* (1864).

TENNENT, WILLIAM, D.D., 1705–77; b. Ireland; brother of Gilbert; came to America, 1718. While studying theology he was attacked with fever, and fell into a trance, giving no sign of life, except a slight tremor under the left arm, which led the physician to refuse consent to his interment, and the funeral was postponed for three days, when vitality became perceptible. His recovery was slow and painful, for months his memory and mental faculties seemed lost. At length he felt a sudden shock in his head, and by degrees recovered his recollection. He related that at the time of his apparent death he found himself in the midst of wonderful glory, among a multitude singing very sweetly, and that when about to join them some one said to him, "You must go back." At the shock of this announcement he awoke. He was ordained in Freehold, N. J., 1733, and continued as pastor 44 years. He published a few sermons.

TENNESSEE, a central southern state, and the third in order of admission; stretch-
in from lat. 35° to 36° 30' n.; and from long. 81° 37' to 90° 28' w.; bounded on the n. by Kentucky and Virginia; on the e. by North Carolina; on the s. by Georgia, Alabama, and Mississippi; on the w. by Arkansas and Missouri, the Mississippi river separating; greatest length e. to w. about 432 m.; greatest breadth, 109 m.; land area, 41,750 sq. m.; gross area, 42,050 sq. m., or 26,912,000 acres.

HISTORY.—The name of the state is derived from that given by the Indians to the Little Tennessee river—Tannassee. As early as 1754 emigrants from North Carolina entered what is now the eastern part of Tennessee, and in 1776, when the constitution of North

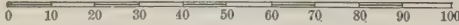
AREA AND POPULATION OF KENTUCKY BY COUNTIES.

ELEVENTH CENSUS: 1890.

| | Area in Square Miles. | Population. | | Area in Square Miles. | Population. |
|-------------------|-----------------------------|-------------|-----------------|-----------------------------|-------------|
| Adair..... | 400 | 13,721 | La Rue..... | 260 | 9,433 |
| Allen..... | 335 | 13,692 | Laurel..... | 450 | 13,747 |
| Anderson..... | 200 | 10,610 | Lawrence..... | 465 | 17,703 |
| Ballard..... | 250 | 8,390 | Lee..... | 228 | 6,205 |
| Barren..... | 445 | 21,490 | Leslie..... | 420 | 3,964 |
| Bath..... | 270 | 12,813 | Letcher..... | 310 | 6,920 |
| Bell..... | 350 | 10,312 | Lewis..... | 450 | 14,803 |
| Boone..... | 270 | 12,246 | Lincoln..... | 328 | 15,962 |
| Bourbon..... | 244 | 16,976 | Livingston..... | 360 | 9,474 |
| Boyd..... | 180 | 14,033 | Logan..... | 544 | 23,812 |
| Boyle..... | 180 | 12,948 | Lyon..... | 275 | 7,628 |
| Bracken..... | 200 | 12,369 | McCracken..... | 250 | 21,051 |
| Breathitt..... | 450 | 8,705 | McLean..... | 256 | 9,887 |
| Breckinridge..... | 520 | 18,976 | Madison..... | 385 | 24,348 |
| Bullitt..... | 272 | 8,291 | Magoffin..... | 300 | 9,196 |
| Butler..... | 452 | 13,956 | Marion..... | 336 | 15,648 |
| Caldwell..... | 315 | 13,186 | Marshall..... | 330 | 11,287 |
| Calloway..... | 434 | 14,675 | Martin..... | 235 | 4,209 |
| Campbell..... | 140 | 44,208 | Mason..... | 225 | 20,773 |
| Carlisle..... | 190 | 7,612 | Meade..... | 332 | 9,484 |
| Carroll..... | 165 | 9,266 | Menifee..... | 150 | 4,666 |
| Carter..... | 544 | 17,204 | Mercer..... | 250 | 15,034 |
| Casey..... | 444 | 11,848 | Metcalfe..... | 410 | 9,871 |
| Christian..... | 708 | 34,118 | Monroe..... | 272 | 10,989 |
| Clark..... | 260 | 15,434 | Montgomery..... | 200 | 12,367 |
| Clay..... | 580 | 12,447 | Morgan..... | 288 | 11,249 |
| Clinton..... | 220 | 7,047 | Muhlenberg..... | 484 | 17,955 |
| Crittenden..... | 340 | 13,119 | Nelson..... | 380 | 16,417 |
| Cumberland..... | 315 | 8,452 | Nicholas..... | 190 | 10,764 |
| Daviess..... | 410 | 33,120 | Ohio..... | 610 | 22,946 |
| Edmonson..... | 348 | 8,005 | Oldham..... | 170 | 6,754 |
| Elliott..... | 270 | 9,214 | Owen..... | 312 | 17,676 |
| Estill..... | 250 | 10,836 | Owsley..... | 176 | 5,975 |
| Fayette..... | 252 | 35,698 | Pendleton..... | 310 | 16,346 |
| Fleming..... | 340 | 16,078 | Perry..... | 448 | 6,331 |
| Floyd..... | 410 | 11,256 | Pike..... | 780 | 17,378 |
| Franklin..... | 200 | 21,267 | Powell..... | 144 | 4,698 |
| Fulton..... | 190 | 10,005 | Pulaski..... | 870 | 25,731 |
| Gallatin..... | 130 | 4,611 | Robertson..... | 210 | 4,684 |
| Garrard..... | 225 | 11,138 | Rockcastle..... | 280 | 9,841 |
| Grant..... | 280 | 12,671 | Rowan..... | 320 | 6,129 |
| Graves..... | 550 | 28,534 | Russell..... | 260 | 8,136 |
| Grayson..... | 570 | 18,688 | Scott..... | 272 | 16,546 |
| Green..... | 275 | 11,463 | Shelby..... | 405 | 16,521 |
| Greenup..... | 352 | 11,911 | Simpson..... | 320 | 10,878 |
| Hancock..... | 200 | 9,214 | Spencer..... | 200 | 6,760 |
| Hardin..... | 580 | 21,304 | Taylor..... | 270 | 9,353 |
| Harlan..... | 410 | 6,197 | Todd..... | 360 | 16,814 |
| Harrison..... | 315 | 16,914 | Trigg..... | 425 | 13,902 |
| Hart..... | 410 | 16,439 | Trimble..... | 155 | 7,140 |
| Henderson..... | 472 | 29,536 | Union..... | 380 | 18,229 |
| Henry..... | 272 | 14,164 | Warren..... | 530 | 30,158 |
| Hickman..... | 240 | 11,637 | Washington..... | 300 | 13,622 |
| Hopkins..... | 550 | 23,505 | Wayne..... | 590 | 12,852 |
| Jackson..... | 305 | 8,261 | Webster..... | 340 | 17,196 |
| Jefferson..... | 375 | 18,598 | Whitley..... | 580 | 17,590 |
| Jessamine..... | 162 | 11,248 | Wolfe..... | 190 | 7,180 |
| Johnson..... | 300 | 11,027 | Woodford..... | 247 | 12,380 |
| Kenton..... | 152 | 54,161 | | | |
| Knott..... | 365 | 5,438 | | | |
| Knox..... | 350 | 13,762 | | | |
| | | | Total..... | 40,000 | 1,858,635 |

KENTUCKY AND TENNESSEE

SCALE OF MILES



County Towns

Railroads

ILLINOIS

MISSISSIPPI

MISSISSIPPI

MISSISSIPPI

INDIANA

ALABAMA



AREA AND POPULATION OF TENNESSEE BY COUNTIES.

ELEVENTH CENSUS : 1890.

| | Area in Square Miles. | Population. | | Area in Square Miles. | Population. |
|-----------------|-----------------------------|-------------|-----------------|-----------------------------|-------------|
| Anderson..... | 360 | 15,128 | Lauderdale..... | 450 | 18,756 |
| Bedford..... | 520 | 24,739 | Lawrence..... | 676 | 12,286 |
| Benton..... | 412 | 11,230 | Lewis..... | 280 | 2,555 |
| Bledsoe..... | 300 | 6,134 | Lincoln..... | 540 | 27,382 |
| Blount..... | 614 | 17,589 | Loudon..... | 256 | 9,273 |
| Bradley..... | 280 | 13,607 | McMinn..... | 452 | 17,890 |
| Campbell..... | 488 | 13,486 | McNairy..... | 550 | 15,510 |
| Cannon..... | 280 | 12,197 | Macon..... | 332 | 10,878 |
| Carroll..... | 600 | 23,630 | Madison..... | 520 | 30,497 |
| Carter..... | 298 | 13,389 | Marion..... | 500 | 15,411 |
| Cheatham..... | 400 | 8,845 | Marshall..... | 350 | 18,906 |
| Chester..... | 288 | 9,069 | Maury..... | 600 | 38,112 |
| Claiborne..... | 472 | 15,103 | Meigs..... | 200 | 6,930 |
| Clay..... | 260 | 7,260 | Monroe..... | 580 | 15,329 |
| Cocke..... | 458 | 16,523 | Montgomery..... | 540 | 29,697 |
| Coffee..... | 360 | 13,827 | Moore..... | 170 | 5,975 |
| Crockett..... | 260 | 15,146 | Morgan..... | 448 | 7,639 |
| Cumberland..... | 576 | 5,376 | Obion..... | 540 | 27,273 |
| Davidson..... | 508 | 108,174 | Overton..... | 360 | 12,639 |
| Decatur..... | 310 | 8,995 | Perry..... | 420 | 7,785 |
| De Kalb..... | 310 | 15,650 | Pickett..... | 240 | 4,736 |
| Dickson..... | 620 | 13,645 | Polk..... | 400 | 8,361 |
| Dyer..... | 495 | 19,878 | Putnam..... | 430 | 13,683 |
| Fayette..... | 630 | 28,878 | Rhea..... | 360 | 12,647 |
| Fentress..... | 510 | 5,226 | Roane..... | 450 | 17,418 |
| Franklin..... | 570 | 18,929 | Robertson..... | 536 | 20,078 |
| Gibson..... | 615 | 35,859 | Rutherford..... | 580 | 35,097 |
| Giles..... | 656 | 34,957 | Scott..... | 620 | 9,794 |
| Grainger..... | 294 | 13,196 | Sequatchie..... | 252 | 3,027 |
| Greene..... | 580 | 26,614 | Sevier..... | 560 | 18,761 |
| Grundy..... | 410 | 6,345 | Shelby..... | 728 | 112,740 |
| Hamblen..... | 150 | 11,418 | Smith..... | 368 | 18,404 |
| Hamilton..... | 440 | 53,482 | Stewart..... | 500 | 12,193 |
| Hancock..... | 260 | 10,342 | Sullivan..... | 410 | 20,879 |
| Hardeman..... | 640 | 21,029 | Sumner..... | 536 | 23,668 |
| Hardin..... | 560 | 17,698 | Tipton..... | 404 | 24,271 |
| Hawkins..... | 490 | 22,246 | Trousdale..... | 166 | 5,850 |
| Haywood..... | 570 | 23,558 | Unicoi..... | 196 | 4,619 |
| Henderson..... | 530 | 16,336 | Union..... | 220 | 11,459 |
| Henry..... | 580 | 21,070 | Van Buren..... | 322 | 2,863 |
| Hickman..... | 648 | 14,499 | Warren..... | 446 | 14,413 |
| Houston..... | 210 | 5,390 | Washington..... | 344 | 20,354 |
| Humphreys..... | 420 | 11,720 | Wayne..... | 720 | 11,471 |
| Jackson..... | 280 | 13,325 | Weakley..... | 620 | 28,955 |
| James..... | 210 | 4,903 | White..... | 390 | 12,348 |
| Jefferson..... | 310 | 16,478 | Williamson..... | 550 | 26,321 |
| Johnson..... | 340 | 8,858 | Wilson..... | 536 | 27,148 |
| Knox..... | 520 | 59,557 | | | |
| Lake..... | 210 | 5,304 | Total..... | 41,750 | 1,767,518 |

Carolina was framed, the settlements of what was then styled the District of Washington, sent deputies to the legislative body. The union was never a close one. The mother state neglected the remote and exposed villages beyond the mountains, and in 1784 voted to cede that section of her territory to the United States. Indignant at this action, the settlers asserted their independence, formed the state of Frankland, afterwards Franklin, chose John Sevier governor, elected delegates to a legislature which met in 1785 and requested admission to the union on their own responsibility. Both Congress and North Carolina refused to accede to this proposal, and in 1788 the state of Franklin practically came to an end. In 1789 the cession of Tennessee to the general government took place; in 1790, the territory was organized with Kentucky as the territory of the United States, south of the Ohio; in 1794 it was granted a distinct territorial government, and in June, 1796, it was admitted as a state, with Knoxville as its capital. At that time there were no settlements in western Tennessee, and but a few scattered ones in the middle part of the state. But the westward tendency of emigration soon led to encroachment on portions occupied by the Indians, who were finally removed, in 1819, to the Indian territory, and after that year the growth of Tennessee was rapid; from 1812-15 the legislature met at Nashville; from 1815-26 at Murfreesboro, and from 1826 on at Nashville, which was made the permanent capital in 1843.

In Jan., 1861, a proposal to secede from the Union was defeated, but was carried in June by a majority of 57,667, and in ten months' time the state raised 50 regiments for the Confederacy. The union army received 31,092 men from Tennessee, 20,133 of whom were colored, and the federal cause received enthusiastic support in the eastern mountain region. Nearly the whole state was a battle ground during the war. Severe battles took place at Fort Pillow, Stone River, Island Number Ten, Nashville, Chickamauga, Lookout Mountain, Missionary Ridge, Knoxville, Franklin, etc. In April, 1865, the state legislature met in Nashville, ratified the 13th amendment to the United States constitution, and reorganized the state government, and in 1866 the senators and representatives took their places in Congress.

TOPOGRAPHY, GEOLOGY, ETC.—T. for civil purposes is divided into east, west, and middle T., and comprises 8 great natural divisions. On its eastern borders rises, in huge, ridge-like masses and treeless domes, the Appalachian chain, the loftiest peaks of which attain an elevation of more than 6,000 ft. above the sea. This chain is composed of the Iron, Great Smoky, the Unaka and other mountains, and forms one of the natural divisions of T. Adjoining it on the w., and enclosed between them and what is known as the Cumberland table-land, is the valley of east T., one of the most important agricultural regions. Next comes the Cumberland table-land, an elevated plateau 2,000 ft. above the sea and 1000 ft. above the valley of east T. Then, resting against the western edge of the Cumberland table-land and extending to the Tennessee river, with an average elevation of 1000 ft. above the sea, are the highlands, rimlands, or terrace lands. In the center of these is the great central basin, elliptical in shape, and resembling the bed of a drained lake. Its soil is productive of all the crops suited to the latitude, and it is called sometimes the garden of the state. The western valley forms the sixth natural division, which is comparatively narrow, with spurs from the highlands pointing in towards it and here and there running down to the margin of the T. river. The seventh division is a plateau or slope of west T., and differs from all the others in having only a few rocks. Its soil is light, porous, siliceous, and very fertile. The eighth division is the bottom of the Mississippi, a low, flat, alluvial plain, which has a rank luxuriance of vegetable life that is almost tropical.

The Mississippi forms the w. boundary, receiving all other streams. The Cumberland flows for about 250 m. through the northern part, and the Tennessee crosses the state twice. Besides the affluents of the Tennessee (q.v.), the Big Hatchee, Forked Deer, and Obion are important streams. The eastern mountain-border consists mainly of silurian rocks, and in part is believed to be of the azoic age. It affords asbestos, kaolin, and red, green, and other granites. Valuable copper mines are also found in this region, and the foot-hills abound in iron ore, including rich pyrites, limonite, hematite, magnetite, and iron-manganese ores. In the valley of east T. are lithographic shale, dyestone, heavy-spar, millstone, slate, potters' clay, limestone, native blue vitriol, marble, and ores of lead and zinc. Coal-measures occupy about 5,100 sq. m., mainly occupying the Cumberland mountain plateau, from which an annual product of 900,000 tons is usually derived. Middle T. contains petroleum, saltpetre, alum, gypsum, glass-sand, marble, copperas, fictile clay, and iron. In west T. lignite coal is found in abundance, and there are beds of green-sand marl. In the limestone regions are numerous caves, mostly unexplored. Several in the Cumberland Mountains are 100 ft. deep, and miles in extent. A considerable river has been discovered in one at a depth of 400 ft.; another opening perpendicularly into a mountain has never been fathomed. In some of these caves are large deposits of fossil bones of extinct animals. In some localities are seen impressions of the feet of animals in limestone. Tracts of several acres have sunk into caverns 100 ft. deep. In many places are interesting remains of ancient mounds and fortifications, similar to those found in Ohio.

ZOOLOGY AND BOTANY.—The wild animals include the bear, deer, opossum, raccoon,

fox, and squirrel. The forests of the state have a large variety of timber-trees. In the east the white and other pines grow across extensive tracts; in the west the larch, cypress, and cotton-wood, and nearly everywhere may be found the tulip-tree, hickory, magnolia, sweet and black gum, black and white walnut, cherry, pecan, ash, maple, locust, beech, chestnut, and several kinds of oak. The persimmon, paw-paw, crab-apple, plum, fox-grape, haw, whortleberry, gooseberry and strawberry are common.

CLIMATE AND AGRICULTURE.—The general elevation of the state secures it from the oppressive summer heat of the Gulf States, and the winters are in no parts severe. Along a line running e. and w. through the middle of the state the mean temperature is 57° in east Tennessee, 58° in middle, and 59° in west Tennessee. On the southern boundary it is about 1° higher, and on the northern 1° lower. The only sickly region is the swampy part. The average annual rainfall at Memphis is 45.46 ins.

Tennessee has always been a large cotton-producing state, although since the "Less Cotton Convention" of 1891 the acreage has been greatly reduced. Prices, however, have advanced at least 40 per cent., and growers are slowly recovering from the effects of ruinous markets resulting from excessive production. In tobacco, Tennessee ranks next to Kentucky, North Carolina, and Virginia, with a yield of over 35,000,000 lbs. The principal crops, in round numbers, are—corn, 72,000,000 bushels; oats, 7,250,000 bushels; wheat, 7,000,000 bushels; potatoes, 2,150,000 bushels; hay, 500,000 tons; and cotton, 350,000 bales. Hemp, flax, broom-corn, sorghum, and rice are raised in certain localities, and garden vegetables nearly everywhere in abundance. The dairy products exceed annually 16,000,000 lbs. of butter, 120,000,000 lbs. of cheese, and 1,000,000 gallons of milk. Increased attention is being paid to the breeding of fine stock, especially horses. Belle Meade, said to be the largest and most complete establishment of its kind in the world, was founded over a century ago by John Harding. It embraces 5300 acres, including a deer park of 500 acres. The farms cover an area of over 20,000,000 acres, and with buildings and fences represent an investment of more than \$242,000,000. Farm and ranch animals exceed 3,500,000 head in number and \$35,000,000 in value, and are principally swine, cattle, sheep, and horses.

MANUFACTURES, INDUSTRIES, ETC.—The industries of Tennessee are both numerous and profitable. The U. S. census of 1890 reported for the state, 4559 manufacturing establishments employing \$51,475,092 capital and 42,759 persons, paying \$16,899,351 for wages and \$40,463,782 for materials, and having a combined output valued at \$72,355,286. The principal manufactures, according to the value of output, were flour and grist, lumber products, iron and steel, foundry and machine shop products, cotton goods, cotton seed oil and cake, brick and tile, leather, woolen goods, clothing, marble and stone work, and coke. Among other products are cars, carriages, furniture, metallic wares, tar, turpentine, and charcoal. There are copper, milling, and smelting works. Zinc and zinc paints are made at Clinton and Knoxville. The Tennessee marbles are considered the finest in the world, and are found in every variety. Copper is found in Polk county and lead in Bradford, Washington, and Monroe counties. There are over 40 coal mines in operation, yielding an annual output of over 2,500,000 short tons, valued at the mines at over \$2,350,000. The discovery of phosphate rock in Hickman and Lewis cos. has resulted in a new and important industry. In 1895 petroleum oil was struck in Fentress co., and within six months over \$8,000,000 capital was invested in oil plants, and over 400 wells were in operation.

COMMERCE AND TRANSPORTATION.—The state has no direct foreign commerce, although Memphis and Nashville are both river ports of entry. Both cities have very large annual shipments of cotton, tobacco, grain, and general produce. The entire wholesale trade of the state has been estimated at \$300,000,000. The state has over 4000 miles of railroad, more than three-quarters of which belong to local roads. The capital stock of all roads exceeds \$96,000,000; funded debt, \$112,000,000; cost of roads and equipments, \$202,000,000; net earnings, \$2,900,000. The principal roads are the Southern and the Louisville and Nashville, with their numerous branches.

BANKS.—On Oct. 31, 1896, there were 48 national banks, with capital \$8,275,000, and deposits \$14,835,903; 48 state banks, capital \$3,359,602, and deposits \$5,589,527; and 4 stock savings banks, capital \$250,000, and deposits \$1,135,972.

CHURCHES, EDUCATION, ETC.—The principal religious organizations are: Baptist, Christian, Congregational, Protestant Episcopal, Friends, Jewish, Lutheran, Methodist, Presbyterian, Roman Catholic, and United Brethren in Christ,—the Methodist, Baptist, and Presbyterian leading.

The educational interests of the state until 1873 were much neglected. Though there were many higher institutions, the common schools were allowed to go without system or state aid. At that date the legislature passed a general law establishing schools, and made provisions for their maintenance. For general supervision there is a state superintendent of public schools, nominated biennially by the governor and confirmed by the senate; for local supervision, a superintendent for each county is chosen by the county court biennially; and in each district there are three directors, elected by the people for three years, one going out each year. The law requires state and county superintendents to be persons of literary and scientific attainments and of skill and experience in the art of teaching. The public schools are free to all youth of school age (6-21), but separate schools must be maintained for white and colored. The value of public school property is about \$3,000,000; annual expenditure for public schools, \$1,600,000; school popula-

tion, over 625,000: enrollment, 485,000: average daily attendance, 350,000. The principal higher institutions are the university of Tennessee, Knoxville; Vanderbilt university, Fisk university, Roger Williams university, and university of Nashville, all at Nashville; U. S. Grant university, Chattanooga; Cumberland university, Lebanon; university of the South, Sewanee; and the Southwestern Presbyterian university, Clarksville. The charitable institutions include asylums for the insane at Knoxville, Nashville, and Bolivar; institution for the deaf and dumb, Knoxville; institution for the blind, Nashville; industrial school, Nashville; and a home for confederate soldiers, near Nashville.

GOVERNMENT, ETC.—The capital is Nashville. The constitution provides that every male citizen 21 years old, who has resided in the state one year and co. six months, shall be entitled to vote. The executive power is vested in a governor, who is chosen every two years (salary, \$4000); a secretary of state, elected by a joint vote of a general assembly every four years; a treasurer and comptroller of the treasury, elected in the same manner every two years; an attorney-general, appointed by the supreme court judges every six years; and a state superintendent of schools, nominated by the governor and confirmed by the senate every two years. The house of representatives has 99 members and the senate 33, who are elected for two years. The judicial power is vested in a supreme court of five judges, elected for eight years, with salary of \$4000 each, and in the usual minor courts.

The legal and only rate of interest allowed is 6 per cent.; the penalty for usury is forfeiture of excess of interest. Outside of incorporated cities it is unlawful to sell intoxicating beverages within four miles of an incorporated institution of learning.

The electoral votes have been cast as follows: 1796, Jefferson and Burr, 3; 1800, Jefferson and Burr, 3; 1804, Jefferson and Clinton, 5; 1808, Madison and Clinton, 5; 1812, Madison and Gerry, 8; 1816, Monroe and Tompkins, 8; 1820, Monroe and Tompkins, 7; 1824, Jackson and Calhoun, 11; 1828, Jackson and Calhoun, 11; 1832, Jackson and Van Buren, 15; 1836, White and Tyler, 15; 1840, Harrison and Tyler, 15; 1844, Clay and Frelinghuysen, 13; 1848, Taylor and Fillmore, 13; 1852, Scott and Graham, 12; 1856, Buchanan and Breckenridge, 12; 1860, Bell and Everett, 12; 1868, Grant and Colfax, 10; 1872, Greeley and Brown, 12; 1876, Tilden and Hendricks, 12; 1880, Hancock and English, 12; 1884, Cleveland and Hendricks, 12; 1888, Cleveland and Thurman, 12; 1892, Cleveland and Stevenson, 12; 1896, Bryan and Sewall, 12.

The funded state debt, Jan. 1, 1890, was \$14,110,900; unfunded, \$2,239,000; amount raised by taxation, 1890, \$1,295,000; amount of taxable property as assessed, \$347,508,000; rate state tax on \$100, 30 cts.; receipts for the year ending Dec. 19, 1889, \$2,093,000; expenditures, \$2,029,000. The outstanding new settlement debt, all interest-bearing, in 1897, was \$15,702,800; estimated amount of bonds then fundable, \$940,000; total assessed property valuation (1896), \$312,472,633.

POPULATION.—In 1790, 35,891—3417 slave, 361 free col'd; 1820, 422,771—80,107 slave, 2737 free col'd; 1840, 829,210—183,059 slave, 5524 free col'd; 1860, 1,109,801—275,719 slave, 7300 free col'd; 1880, 1,542,359—403,343 col'd; foreign born, 16,702; male, 769,277; female, 773,082; dwellings, 276,734; families, 286,539; persons to sq. m., 36.94; engaged in agriculture, 294,153; rank of state, 12th in pop., and 18th in value home manufactures; population, 1890, 1,767,518. There are 96 cos.; for pop., 1890, see Census Tables, Vol. XV. The largest cities, 1890, were Nashville, 76,168; Memphis, 64,495; Chattanooga, 29,100; Knoxville, 22,535.

See Ramsey's *Annals of Tennessee to the End of the Eighteenth Century* (Phila., 1853); Phelan's *History of Tennessee* (1888); Putnam's *History of Middle Tennessee* (Nashville, 1859); May's *Pioneers of Nashville and of Tennessee* (Nashville, 1880); Kirke's *The Rear Guard of the Revolution* (N. Y., 1886) and *John Sevier* (N. Y., 1887); Safford's *Geology of Tennessee* (1869); Killebrew's *The Resources of Tennessee* (Nashville, 1874).

TENNESSEE, a river of the United States, the largest tributary of the Ohio, has its origin in the union of the Clinch and Holston, which rise in the Alleghany Mountains of south-western Virginia, and, flowing s.w. in two parallel valleys, unite at Kingston in the w. of Tennessee state. The river flows still s.w. in the Alleghany valley, entering Alabama close by the n.w. corner of Georgia, whence it flows 60 miles further in the same course, then, turning to the w.n.w., re-enters Tennessee at the n.e. corner of Mississippi, flows northwardly across the state, then n.w. across Kentucky to its confluence with the Ohio at Paducah; length 800 miles, or, from the source of the Holston, 1100. Its chief branches are the Sequatchie, Paint Rock, Flint, Duck, North Branch, Hiawasse, Big Sandy, and Clark's. It is navigable 259 miles to Mussel Shoals—a series of broad shallow rapids—and 500 miles above. The river falls about 2000 ft. during its course. Chief towns, Florence and Decatur in Alabama; and Chattanooga, Tennessee.

TENNEY, in heraldry, orange color, one of the tinctures enumerated by heralds, but not of frequent occurrence in coat-armor. It is indicated in engravings by lines in bend sinister, crossed by other barways.

TENNEY, SAMUEL, 1748–1816; b. Mass.; graduated at Harvard, 1772; began practice as a physician in Exeter, N. H.; became a surgeon in the revolutionary army, and was present at the battles of Saratoga and Yorktown. From 1800 to 1807 he was a member of congress. He was one of the first members of the American academy of arts and sciences, and published many scientific treatises and political essays.

TENNEY, SANBORN, 1827–77; b. N. H.; educated at Amherst college, and studied natural history with Agassiz. He was for some years a lecturer on natural history,

of which he became professor in Vassar college at its foundation. He was called to a similar position at Williams college in 1868. Among his publications are: *Geology for Teachers, Classes, and Private Students; a Manual of Geology; Natural History Tablets; and Elements of Zoology.*

TENNEY, WILLIAM JEWETT, b. Newport, R. I.; 1814-83; a graduate of Yale college, 1832: He was co-editor of the *Journal of Commerce*, of the New York *Evening Post*, and editor of the *Mining Magazine*. He was one of the editors of Appleton's *Annual Cyclopædia*. He also edited an illustrated edition of *The Queens of England*, and prepared *The Military and Naval History of the Rebellion in the United States* (1865). He was at one time collector of the port of Elizabeth, N. J.

TENNIEL, Sir JOHN, English artist, born in London in 1820, and educated at Kensington. At an early age he manifested a marked taste for art, and may be said to have been entirely self-taught. In 1845 he was a successful candidate in a cartoon competition in Westminster hall, and in 1851 joined the staff of *Punch*, with which paper he has ever since been connected. His artistic work includes a fresco in the palace at Westminster, and many paintings, chiefly for private collections, besides numerous illustrations of Christmas and other books, such as *Æsop's Fables*, *Lalla Rookh*, *The Ingoldsby Legends*, *Alice's Adventures in Wonderland*, and its sequel *Through the Looking-glass*. He has been for many years a member of the Royal Institute of Painters in Water Colors, and was knighted in 1893.

TENNIS, a game of great antiquity, belongs to the class of ball-games, and finds its analogies in the *sphairistikos* of the Greeks, and the *pila* of the Romans. Under the name of *paume*, a name given to it from the ball being at that time struck with the palm of the hand, it is noticed in the Arthurian romances, and in the earlier records of the dark ages. In the 15th c. it was in great vogue in France among all classes, from the monarch to the meanest of his subjects; and about this time the use of a heavy glove to protect the hand in striking the ball was introduced, and a further improvement was subsequently effected by the adoption of the *racket*. The game in England kept pace with its progress in France, and, during the 16th, 17th, and 18th centuries, was generally practiced under the name of *tennis*. Many modifications have been introduced, but the legitimate descendant of the *paume* and tennis of former days is the present game of rackets. (See **LAWN TENNIS**). "Rackets" is played in a court 96 or 97 ft. long, by 33 or 34 feet wide, and surrounded by walls sufficiently high to prevent the balls from being lost. The players are either two in number, or four, divided into two parties. The player or party "in" serves the ball against the head-wall of the court, so as to rebound over a line drawn at a certain distance; it is returned by means of the racket by the player or party "out," who must make it rebound from the wall to the other side of the line; and the game is thus carried on till one player fails to strike the ball or cause it to rebound properly. If the player "in" fails, he changes places with the player "out;" if the latter fails, the former scores a point. The part of the court on which the player or party in is placed is called the "service" side; the other the "hazard" side. A similar game played without the racket is called *jives*, *hand-tennis*, or *hand-ball*. See **LAWN TENNIS**.

TENNYSON, ALFRED, first baron, b. in 1809 at Somersby, in Lincolnshire, of which parish his father was rector. He was the third of a large family, several other members of which shared with him in some measure the genius which has won for him undisputed rank as the first English poet of his time. Very early the bent of nature became obvious; and in 1827 Tennyson, along with his brother Charles, issued a small volume, entitled *Poems, by Two Brothers*, of which almost nothing has been preserved. Having gone to complete his education at Trinity college, Cambridge, he gained in 1829 the chancellor's medal by a poem in blank verse, entitled *Timbuctoo*, in which there is plainly to be traced some impress of his peculiar genius. His literary career, however, may properly be said to date from 1830, in which year a volume appeared of *Poems, chiefly Lyrical*, by Alfred Tennyson. It was not received with great favor by the public; but amid much that was weak and immature, it contained pieces which in no indistinct manner announced the advent of a true poet. In a notice of the book by prof. Wilson, in *Blackwood's Magazine*, the promise of the young writer was recognised in sufficiently express terms. The praise was, however, not unmixed with censure, which, though it seemed on the whole judicious, did not commend itself as such to the poet, who retaliated on "crusty Christopher" in his next volume, published in 1832. This consisted of a selection of poems from the previous one, carefully retouched by the writer, with the addition of pieces produced in the interval, many of which have scarcely been surpassed in beauty by anything he has since produced. Onward from this time the reputation of the writer slowly but surely extended itself; and the publication, in 1842, of *Poems, by Alfred Tennyson*, in two volumes, raised him to the position of absolute supremacy which he has ever since continued to occupy by almost universal consent. In 1847 appeared *The Princess, a Medley*; and in 1850 the series of elegies entitled *In Memoriam, A. H.*, a tribute of affection to the memory of Arthur Hallam, a son of the eminent historian, and the chosen friend of the poet in his earlier years at Cambridge. On the death of Wordsworth, in 1850, Tennyson succeeded him as poet-laureate, in which capacity he issued, in 1852, his *Ode on the Death of the Duke of Wellington*. In 1855 appeared *Maud, and other Poems*. The immediate reception of this little volume was not enthusiastic. While many of its lyrics instantly caught

the public ear, *Maud*, as a whole, at first rather puzzled the critics, and was little better than "caviare to the general;" and though it has since risen in estimation, the subtle and recondite art exhibited in the structure of the poem is probably even now appreciated by only a few of its admirers. But for any little falling off in Tennyson's popularity on this occasion, a noble *amende* was made him on his next appearance. *The Idylls of the King*, published in 1859, were everywhere received with enthusiasm. With scarce a whisper of dissent, this work at once took rank as one of the noblest poems in our language. It was followed in 1864 by a volume, containing *Enoch Arden*, one of his most finished and successful works; *Aylmer's Field*; a short piece, *Tithonus*, consummate in its beauty and finish; and a few other poems of a somewhat less elaborate character; one of which, however, *The Northern Farmer*, written in the Lincolnshire dialect, is singularly striking. Since then Tennyson has given us several new *Idylls*, which may be considered to complete his handling of the Arthurian romance: *The Holy Grail* and *Pelleas and Ettarre* (1869); and *Gareth and Lynette*, and *The Tournament* (1872). *The Window, or Songs of the Wrens*, appeared in 1870; *The Lover's Tale*, in 1879; *Ballads*, etc., in 1880. *Queen Mary*, a drama, published 1875, was followed by *Harold*, also a play, in 1876. *The Falcon* was acted in 1879; *The Cup*, in 1881; *The Promise of May*, in 1882; *Becket*, in 1884, and *The Foresters* (1892). The last two have been successfully put on the stage both in America and in England. The collected editions of Tennyson's works (since 1872) arrange the various *Idylls of the King* in the order, not of their publication, but of their proper sequence in the legend of Arthur, and enable the reader to appreciate the beauty and significance of the ideal story. Tennyson lived for the most part a retired life in the Isle of Wight, not much caring to cultivate society, but greatly beloved by his friends. He was made a baron, 1883; pub. *Tiresias* (1885); *Demeter* (1889).

It is not an easy matter to criticise the poetry of Tennyson dispassionately, so deeply is one apt to become enamored of its beauties. His verse is the most faultless in our language, both as regards the music of its flow and the art displayed in the choice of words. Nowhere in literature is the *callida junctura verborum* so wondrously seen. As a painter, no modern poet has equaled him. But it is neither to his color nor to his music alone that he owes his great popularity. His *virtue* as a poet doubtless lies in these things; but the pleasure which his poetry gives springs largely from the cordial interest he displays in the life and pursuits of men, in his capacity for apprehending their higher and more beautiful aspirations, and in a certain pervasive purity and strength of spiritual feeling. Lord Tennyson died Oct. 6, 1892. His widow, Lady Emily Tennyson, died Aug. 10, 1896. See Van Dyke, *The Poetry of Tennyson* (1889); Collins, *Illustrations of Tennyson* (1891); Ritchie, *Records of Tennyson* (1892); Stopford Brooke, *Tennyson* (1894), and the *Memoirs* by the poet's son, Baron Hallam Tennyson.

TENNYSON, Baron HALLAM, the eldest son of Baron Alfred Tennyson, was born at Twickenham in 1852, received his education at Trinity college, Cambridge. He published in 1897 *Alfred Lord Tennyson, a Memoir*. He has also edited and wrote (1880) a memoir for a volume of sonnets by his uncle, Charles Tennyson Turner, and has translated from the Saxon a poem, *Brunanbush*, later done into English verse by his father.

TENON, in carpentry, the square end of a timber, reduced about one-third its thickness, to fit the mortise or socket in another timber, so as to join the two.

TENOR, in music, one of the four classes into which voices are divided in respect of their compass. It is the higher adult male voice. Music for tenor voices is most properly written on the tenor or C clef, in which its principal tones come within the staff; but the treble clef is occasionally used, with the notes written an octave above their true pitch.

TENOTOMY, or the division of tendons, is a comparatively recent surgical operation, whose object is to relieve some variety of deformity by severing a permanently contracted muscle at its tendinous portion. The invention of subcutaneous tenotomy is due to Stromeyer (1831), and a lucid account of the history of this operation is given by Dr. Little in his *Treatise on Club-foot and Analogous Deformities* (Lond. 1839). The various kinds of knives that have been devised for severing tendons are termed *tenotomes*. The affections in which tenotomy is advantageously employed are club-foot, contractions of the upper extremity from spasm and paralysis, deformity from diseases of the palmar fascia, torticollis or wry-neck, ankylosis of the knee and other articulations, and squinting.

TENREC, or **TANREC**, *Centetes*, a genus of mammalia, nearly allied to moles and hedgehogs, usually ranked in the family *erinaceida*. The tenrecs are incapable of rolling themselves up like hedgehogs. They are nocturnal animals, natives of Madagascar and the Mascarene isles. Three species are known. They are remarkable for spending the hottest part of the year in a dormant state, as some animals in arctic regions spend the winter. Their flesh has a very peculiar flavor, but is acceptable to the natives of Madagascar.

TENSAS, a parish in n.e. Louisiana, lying on the Mississippi; drained by Tensas river and Macon bayou; 610 sq.m.: pop. '90, 16,647, chiefly of American birth; mostly colored. Surface low, level, and fertile; corn, cotton, and sweet potatoes are the staples. Parish seat, St. Joseph.

TENSE (Fr. *temps*, from Lat. *tempus*, time), in grammar, designates a set of changes which verbs undergo in order to mark the time of the action. See CONJUGATION.

TENT (Lat. *tentorium*, from *tentus*, stretched). Without speculating on the relative priority of tents and other forms of human dwellings, it is safe to assume, that among nomadic tribes, some shelter, easily framed and portable, must have been felt to be a primary necessity. The skins of animals, or the larger kinds of foliage, would form the earliest coverings, for which textile fabrics would be substituted as civilization advanced. In the book of Genesis, the patriarchs, Noah, Abraham, Lot, Isaac, Jacob, are represented as dwelling in tents, probably much the same as the modern Arab tents, which are large structures, very rude in form, covering a considerable space of ground, but of small height. Among the Nineveh sculptures is a representation of the tent of king Sennacherib, which, like modern tents, was supported by ropes: numerous tents of the officers and common people are likewise shown.

The early Greek, and afterward the Macedonian tents were small coverings of skins, under each of which two soldiers slept. Alexander the great is said to have had a pavilion of extraordinary magnificence. Its roof, one mass of gilded embroidery, was sustained by eight pillars covered with gold. In the center, was the royal throne; and 100 beds could be made up within the temporary edifice.

The Roman soldiers seem to have used two sorts of tents—one, a tent proper, of canvas or some analogous material, and constructed with two solid upright poles, and a roof-piece between them; the other, more resembling a light hut, of a wooden skeleton, covered by bark, hides, mud, straw, or any material which afforded warmth. Of these tents, the poles of the first would have been too cumbrous for carriage, and were probably cut afresh at each halting-place; the latter was evidently unsuited to removal, and was most likely only erected for winter-quarters, or a long sojourn. The Roman tent held 10 soldiers, with their *decanus*, or corporal.

In Persia, there are many tribes who pass their whole time in tents, which, naturally, they have brought to considerable perfection. They make them nearly hemispherical, with a wooden framework, and covered with felt, while worked hangings close the aperture. This felt admits of the exhibition of much taste in its decoration.

The Chinese lower orders live much in tents. They are ordinarily of matting. These people are clever in their construction, and make them of great size, and with considerable comfort.

Modern military tents are all made of linen or cotton canvas, supported by one or more poles according to shape, and held extended by pegs driven into the ground. British tents comprise the hospital-marquee, a large oblong tent with high side-walls; and the round-tent, or bell-tent, for troops. The latter is 12 ft. 6 in. in diameter, 10 ft. 4 in. high, weighing, with all its appurtenances, 68 lbs., and giving sleeping accommodation to 16 men; the appurtenances comprise 2 mallets, 50 pins, 20 ropes, 20 loops, and 2 long ropes, for use in storms in giving additional firmness round the central pole. In modern tents, there is a low side-wall of canvas, to give greater room inside. These tents are said to be comfortable and moderately healthy, if floored with tarpaulin, vulcanized india-rubber, or other waterproof material. The great drawback is the tendency to blow over. To obviate this, and the inconvenience arising from the conical shape, maj. Rhodes, a British officer, invented some years ago a new tent, which has found much favor both in this and in other countries. He does away with the central pole, and has a circular frame, hinging in the center like the ribs of an umbrella, over which the canvas is stretched. It is claimed for this tent, that it is more roomy than the regulation-tent, in proportion to its weight, is better ventilated, and possesses far greater stability.

TENTACULITES, a genus of obscure annulated tapering shells, found abundantly in some strata of silurian age. They are generally referred to annelids, but the structure of the shell seems to exhibit greater affinities to recent pteropodous mollusks.

TENTERDEN, a municipal borough and market-t. in the Weald of Kent, 18 m. s.s.c. of Maidstone. The church, which contains portions of early English, is surmounted by a massive and lofty perpendicular tower. Tradition asserts that a quantity of stones, which had been got together for the purpose of strengthening the sea-wall of the Goodwin Sands, were employed in the building of this tower, and that when the next storm came, the district of Goodwin Sands, which had formerly belonged to the mainland, was submerged. Thus arose the popular saying, that "Tenterden steeple was the cause of the Goodwin sands." Pop. '81, 3620; '91, 3429.

TENTERDEN, CHARLES ABBOTT, Lord, a distinguished English lawyer, was born at Canterbury, on Oct. 7, 1762. He was the son of a hairdresser. Being admitted on the foundation of the king's school connected with the cathedral, he distinguished himself by perseverance and extreme accuracy. A small exhibition in the gift of the chapter enabled him to proceed to Oxford, where, in 1781, he was elected scholar of Corpus Christi college; and a few years later he obtained what were then the chief distinctions at the university, the chancellor's two gold medals, one being for English, and the other for Latin composition. In due time he became a fellow of his college. After being a student of the Inner Temple in 1795, he was called to the bar. He joined the Oxford circuit; and in spite of a husky voice, a leaden and unmeaning countenance, and painfully timid manners, his great activity of mind, good taste, scholarship, scientific and legal knowledge, were soon appreciated, so that he rapidly acquired a large business. He

published, in 1802, his treatise *On Merchant Ships and Seamen*, in all respects the best written book which had till then appeared on one department of English law. It had the effect of increasing his employment in the more lucrative mercantile causes; and in 1807, it appears from his income-tax return that his fees amounted to upward of £8,000. In 1816 he accepted a puisne judgeship in the court of common pleas; and in 1818 he was knighted, and chosen to succeed lord Ellenborough as chief-justice of the king's bench. As a judge, his most marked characteristic was his evident impartiality and freedom from bias. The comparative leisure he enjoyed on the bench he spent in reading the classics and in the study of botany. He was, in 1827, raised to the peerage. In the house of lords he was the most influential speaker against the Catholic relief bill; and in his last speech he made a vow that if the reform bill, that "appalling bill," passed, he would never again take his seat as a peer. The success of the measure, it is believed, affected his health. He was seized with a violent attack of inflammation in Nov., 1832, when presiding at the trial of the mayor of Bristol for misconduct during the riots, and he died there on the 4th of that month.

TEN THOUSAND, RETREAT OF THE. After the battle of Cunaxa and the death of Cyrus, in the expedition of the latter against his elder brother Artaxerxes, the Greek army being in great straits chose Xenophon as one of their leaders, and by his firmness and prudence were conducted back to Greece after enduring many hardships and fierce warfare. The story is told by Xenophon himself in his *Anabasis, or Retreat of the Ten Thousand*, (see CYRUS and XENOPHON). The entire distance, going and coming was 1155 parasangs, or over 4,000 English m., and the time occupied in the retreat was 8 months. The course was through Media, across the Carduchi range, through Armenia and across the Euphrates, and then through the countries of the Taochi, Chalybes, Macrones, and Colchians, terminating in the Greek colony of Trapezus, on the Euxine sea.

TENUIROSTRÉS, a tribe or sub-order of birds, of the order *insessores*, characterized by a lengthened slender bill, which is sometimes straight, sometimes curved. Some of them feed on insects, some chiefly on the honey of flowers. To this tribe belong the creepers (*certhiadae*), sun-birds (*cinnyridae*), humming-birds (*trochilidae*), and hoopoes (*upupidae*).

TENURE OF LAND, in England, was an accompaniment or immediate consequence of the feudal system (q.v.) established during the middle ages throughout the greater part of Europe. Feuds were introduced by the barbarous tribes who poured themselves into the Roman empire during the 4th, 5th, and 6th centuries. The chief feature of feuds was, that the lands of the conquered country were parceled out to the leaders, on the condition of bearing arms whenever the sovereign required them. The relation thus created between sovereign and vassal was called a feud. The grantee held his lands at first for life only, but gradually it was developed into a hereditary character, and also into one which admitted of subinfeudation, i.e., the parceling out of the feudal land among vassals of the head vassal, who was the lord of his own vassals. This kind of relation between lord and vassal gradually was extended to all kinds of land, for the owners of allodial land voluntarily surrendered their land to some lord, so as to have the same advantages. The vassal did homage to the lord, and took the oath of fealty. Besides these characteristics, the holding came to be attended with the following incidents. 1. An aid, which was a payment granted to help the lord in his necessities. 2. A relief was a tribute paid by a new tenant on succeeding to his predecessor. 3. A fine was paid by a tenant to the lord on alienating the lands to a purchaser. 4. An escheat or forfeiture was the reverting of the estate to the lord when there was a failure of heirs or some violation of duty on the part of the vassal. The feudal system was extended to England by the Norman barons soon after the conquest, with the concurrence of William I., much to the dislike of the Saxons, whose grievances grew until they found vent in Magna Charta, which was in fact an attempt to restore their earlier constitution. The chief fiction, however, of a relation between the crown and the holders of land was not got rid of. The crown was nominally the lord paramount, and there were intermediate lords called mesne lords, of whom the tenants held. Gradually, the kinds of tenure were classed under free and base services—the former being those which a free-man might perform, as serving in war, or paying a sum of money; the latter, such as a peasant might perform, such as ploughing the lord's land, etc. These were afterward further distinguished according to the certainty or uncertainty of the extended service to be performed. Ultimately, the tenures were classed as three. 1. *Knight-service*, or chivalry, i.e., holding on condition of serving in the war, and taking the oath of fealty. This was accompanied by the incidents of descent, wardship (or guardianship of the knight's heir by the lord), marriage (i.e., the lord's right to give the knight's infant in marriage), aids, reliefs, primer seisin (i.e., one year's profits from an heir on his succession), fine, escheat, and forfeiture. These incidents gradually grew irksome. James I. proposed to commute knight-service into an annual fee-farm rent; but this not being done, the statute of 12 Ch. II. c. 24 swept the whole away, and converted it into free socage. 2. *Free socage* was a tenure by some certain and determinate service, as by paying a small fixed rent, or ploughing the lord's lands for a fixed number of days. The incidents were rather less burdensome than those of knight-service, being descent, wardship, marriage,

and reliefs, primer seisin, fines, escheat, and forfeiture. These incidents were all abolished by the above statute of 12 Ch. II. c. 24, and the tenure of free socage is now generally known as freehold. 3. *Villeinage service*, or copyhold (q.v.) tenure, which still exists nearly in its original state. The result is, that in England at the present day the two tenures are freehold and copyhold. The leading characteristic of freehold is, that practically the feudal relation between the crown and the holder is cut off, and the holder is entirely his own lord and master, can sell the estate, devise it by will, give it away, and do what he likes with it free from any interference or payment to the crown. As to copyhold, the feudal relation is kept up to a certain extent between the lord and the copyhold tenants, who must in form pay rents more or less nominal, and fines and heriots (q.v.) to the lord on alienating the lands or succeeding thereto. Yet, practically, the copyholder does not materially differ from a freeholder except that he is liable to these petty and harassing acknowledgments toward a stranger; and by recent statutes, he can compel the lord of the manor to commute these fines and incidents, and convert the tenure into freehold.

In Ireland the tenure of land is almost identical with that in England.

As to Scotland there is a marked difference between the tenure of lands there and the tenure in England. At the present day the feudal system prevails to a great extent, resembling in many respects the English copyhold tenure. Every piece of land there has generally its lord or superior and its vassal, that is say, the vassal has the *dominium utile*, or actual enjoyment, while the superior has a kind of superior interest, or *dominium directum*, which consists in his drawing a rent called a feu-duty, which the vassal is bound to pay, or to forfeit the land. On each alienation or death of the vassal, there must be certain forms superadded, implying a consent or recognition by the superior, and certain casualties or additional payments must be made on such occasions. Recent statutes have tended to extinguish several of these superfluous forms, and make the vassal more independent. But a great many remain unaltered. And not only is there this feudal relation between the crown and its vassals, but these may subdivide the property and create intermediate estates without limit.

TEOCALLI (House of God), the name given to the temples of the aborigines of Mexico, of which many still remain in a more or less perfect state. They were built in the form of four-sided pyramids, and consisted for the most part of two, three, or more stories or terraces, with the temple, properly so called, placed on a platform on the summit. The largest and most celebrated is the pyramid of Cholula, measuring 1440 ft. each way, and 177 in height; it is much defaced, and the temple on its summit has been removed. The teocallis in Yucatan are in far better preservation; they are not generally built in terraces, but rise at an angle of 45° to the level of the platform, with an unbroken series of steps from base to summit. The temples on their summit are sometimes ornamented with bas-reliefs in stucco and hieroglyphic tablets, and the roof is formed by courses of stone approaching each other, and furnished with projections like dormer windows. Not unlike the teocallis are the palaces of the Aztec kings or chiefs, which differ from them in having the pyramid smaller, less prominent, and oblong in plan, while the building, larger and more elaborate, consists for the most part of a stone basement, with square doorways, but without windows, surmounted by a structure which appears to be directly copied from wood-work. On some of these façades we have also rude pillars and grotesque carvings, and there are often a number of chambers in the interior. A palace and temple are sometimes found attached together; and in a few cases, such as the Casa de las Monjas, at Uxmal, the buildings are arranged round a court-yard. See MEXICO. See *ILLUS., ARCHITECTURE*, vol. I.

TEOS (now *Sighajik*), an ancient Ionian city on the w. coast of Asia Minor; on a peninsula s.w. of Smyrna. Here was a celebrated temple of Dionysus, and a theater, of which remains still exist. It was a member of the Ionian confederacy and prosperous till the Persian conquest, when a large part of its inhabitants withdrew to Abdera in Thrace. Its principal production was wine. It was the birthplace of the lyric poet Anacreon.

TEPEE, the Indian name for a tent or a hut constructed of brush, leaves, and saplings. See WICK-I-UP, WIGWAM.

TEPIC, a t. of Mexico, in the state of Jalisco, on a height 400 m. n.w. of the city of Mexico. Tepic is the residence, during the rainy season, of most of the wealthy inhabitants of the port of San Blas, about 25 m. distant. Pop. estimated at from 14,000 to 25,000.

TERAMO (anc. *Interamna*), a t. of southern Italy, in the province of the same name, at the junction of the Tordina and Vezzola, 35 m. s. of Fermo. It is well built, with long and rather wide streets, has a cathedral, a public library, a foundling-hospital, and a botanic garden, carries on an active trade in corn, wine, and olives, and had a pop. of 95,000, commune, 21,100.

Ancient *Interamna* (of which the name Teramo is an Italianized form) was a city of Picenum in the territory of the Prætutii. In the middle ages it also bore the name of Abrutium or Aprutium (supposed to be a corruption of Prætutii), whence the modern name of the district, Abruzzo. Vestiges of the ancient city—a gateway, theater, baths, aqueducts, etc.—are traceable, and many statues, altars, and inscriptions have also been discovered. In the plain below Teramo took place, July 27, 1460, between the army of John, duke of Anjou, and the Milanese allies of Ferdinand I. of Aragon,

one of the most sanguinary battles ever fought in Italy. After the contest at Castelfidardo (1860), Teramo was the first Neapolitan city that opened its gates and gave joyful welcome to king Victor Emmanuel.—Pop. of province '81, 254,986; '95 (est.), 267,801.

TERAPHIM (Heb. plur.), a word of uncertain derivation (connected by some with *Serapis*), denoting certain images, idols, or household gods occurring in the Old Testament, which were consulted as oracles, and probably even worshiped to a certain extent. The gods which Rachel stole are called *teraphim*, and Saul was reproached by Samuel for stubbornness which is like *teraphim*; his daughter placed a *teraph* into David's bed to conceal his flight, etc. There is no proof that this veneration for *teraphim* was not held perfectly compatible with the worship of Jehovah, spite of some reformatory attempts to sweep them away. Many and curious have been the explanations given of the nature of the *teraphim* by different scholars in and out of the synagogue. A vague but generally prevailing notion is that of their having been a kind of astrological automata, which somehow or other could be made to move and to utter certain sounds. All that is certain, however, is only the fact that the real meaning and character of this strange idol had been forgotten already at a very early period.

TERATOLOGY (Gr. *terata*, wonders, or monsters) is a term used in physiology as synonymous with "The History of Montrosities or Anomalous Formations." See **MONSTROSITY**.

TERBIUM, a very rare metal, whose oxide, *terbia*, is found in association with the rare earth yttria, the oxide of yttrium (q.v.).

TERBURG or (TER BORCH), GERARD, a Dutch painter, of an old and respectable family of Zwoll, was b. about 1608, studied first under his father, who was also an artist of note, and afterward visited Germany, Italy, Spain, England, and France. On his return to his native country he settled at Deventer, of which town he became burgomaster, and died in 1681. The elegant ostentatious life of his time, with its superfine courtly manners and splendid costume, found in Terburgh an admirable painter. The central figure in many of his pictures is a young lady with fair hair and dressed in white satin. His most famous piece, however, is a picture containing portraits of the 69 plenipotentiaries who drew up the treaty of Westphalia. In Dr. Waagen's opinion, Terburgh is the real founder of the art of painting conversation-pieces, and at the same time the most eminent master in this style. "In delicacy of execution he is inferior to none, and in a certain tender fusing of the colors he excels all others; but none can be compared with him in the enchanting harmony and silvery tone, and the observance of the aerial perspective. His figures, which are well drawn, have an uncommon ease of refinement, and are frequently very graceful." Terburgh's works are to be found in various English collections; as also in the galleries of Dresden, Munich, Vienna, the Louvre, Amsterdam, and Berlin. See *illus.*, KAULBACH, ETC., vol. VIII.

TERCE (Lat. *tertia*, i.e., *hora*, the third hour), one of the "lesser hours" of the Roman breviary, so called from the time of the day for which it is fixed. See **CANONICAL HOURS**.

TERCE, in the law of Scotland, is the interest or estate which a widow has in the land of her deceased husband at common law. This amounts to a life rent of one-third of such estates. In estimating the estate of the husband all real burdens must be first deducted, and certain other things—as the mansion-house, if there is only one, superiorities and patronage, leases and feu-duties. The mode by which a widow completes her title to the *terce* is by a process called *kenning to the terce* (q.v.), the object of which is to separate her portion from the rest, which goes to the heir, so that each may possess independently his and her portion respectively. She is then in the position of an ordinary proprietor for life. Though *terce* is a legal right, yet this right of the widow may be modified by an ante-nuptial contract, under which she is otherwise provided for.—In England and Ireland a widow has a similar right, called *dower* (q.v.).

TERCEIRA, one of the Azores islands (q.v.), and the second in size of that group, forms one of the central cluster, and lies eastward from San Jorge. Area, 220 sq.m.; pop. '90, 46,528. Steep rocks of lava almost everywhere line the coast; the island is accessible only at few places, and these are defended against invasion by fortifications. The soil is fertile; the plateaux of the mountains afford excellent pastures, and cattle breeding is an important branch of industry; the principal articles of export are wine, timber, and orchil. Chief town of the island, Angra, the capital (pop. 18,000), in the fort of which reside the governor and the bishop of the Azores.

TEREBINTACEÆ. See **ANACARDIACEÆ**.

TEREBRANTIA, a section of the insect order *hymenoptera*, distinguished by the females having an ovipositor. To this section belong sawflies (*tenthredinidæ*), ichneumons, gall-insects, etc.

TEREBRATULA, a genus of deep-sea brachiopodous mollusca. The animal is attached to the shell by a pedicel, and the brachial disk is three-lobed, the center lobe being elongated and spirally convoluted. The shell is smooth, with a truncated perforated beak, the foramen being circular. The shelly loop is very short and simple.

The shell of this genus, and some of its allies, is covered with minute quincuncial perforations, sometimes visible to the naked eye, but usually requiring a lens of a low power to distinguish them. The generic title is now restricted to shells with a short internal loop. The species with long loops are grouped together under the name *Waldheimia*. Of the restricted genus, there is only a single living species (*terebratulula vitrea*); but the fossil species are more than a hundred in number, and are found in all periods of the earth's history, from the Devonian age upward. See *illus.*, *MOLLUSKS*, vol. X.; *MUSCHELKALK PERIOD*, vol. X.

TEREDO, a genus of lamellibranchiate mollusks of the family *pholadidae*; very much elongated, and worm-shaped; the mouth very delicate, open in front and at its lower part, for the passage of the short foot; the shell rather thick, equivalve, destitute of hinge, gaping at both ends. The species are rather numerous, and are generally known by the name of *SHIPWORM* or *PILEWORM*, because they perforate and live in timber. Their perforations are made in the direction of the grain of the timber, except when a knot is met with or the shell of another *teredo*, when they accommodate themselves to circumstances by bending. The cavity is lined with a calcareous incrustation. The aperture by which the *teredo* enters is small, and it grows within the cavity which it makes. Two small valves form the true bivalve shell; the calcareous tube incloses the worm-shaped body of the animal. Its growth is very rapid, and its ravages are often terrible. A piece of deal has been found riddled by shipworms after forty days' immersion. Ships, piles, and all submarine woodwork are destroyed by it. Copper-sheathing is employed to protect ships from the shipworm, or the timber is driven full of short, broad-headed nails, the rusting of which forms a coating which it does not penetrate. The dykes of Holland have been threatened with destruction by its ravages. The *COMMON SHIPWORM* (*teredo navalis*) is said to have been introduced into Europe from warmer climates. It is now, however, extremely abundant in European seas. In the East Indies, a very large species (*teredo gigantea*) is found, generally in shallow water among mangrove trees; it is sometimes more than five feet in length, and at the thickest part three inches in diameter. See *illus.*, *MOLLUSKS*, vol. X.

TEREK', one of the most considerable streams of the Caucasus, rises near the lofty mount Kasbec (about 17,000 ft. high), flows n.w. through the defiles of the mountains, crossing the district of the Kabarda, and reaches the border of the government of Stavropol, where it curves eastward, forming the s. boundary of that government, until, reaching Kisliar, it divides into numerous branches, which form a delta 70 miles broad; and falls into the Caspian sea. It is not navigable. Length, from 300 to 390 m.

TERENTIUS A'FER, **PUBLIUS** (or **TERENCE**), the comic poet, was born at Carthage, about 185 B.C. He was the slave of the Roman senator Publius Terentius Lucanus, who, out of regard to his handsome person and unusual talents, educated him highly, and finally manumitted him. On his manumission, he assumed, of course, his patron's *nomen*, Terentius. His first play was the *Andria*, written in his 27th year, but not acted till 166 B.C. Its success was immediate, and introduced its author to the most refined society of Rome, where his engaging address and accomplishments made him a particular favorite. His chief patrons were Lælius and the younger Scipio, after living with whom in great intimacy for some years in Rome, he went to Greece, where he translated 108 of Menander's comedies. He never returned; and the accounts of how he came by his death are conflicting. He is supposed to have died in his 36th or 37th year, leaving one daughter. Six comedies are extant under the name of Terentius, which are, perhaps, all he produced—viz., *Andria*, *Hecyra*, *Heauton-timoroumenos*, *Eunuchus*, *Phormio*, and *Adelphi*. In conjunction with Plautus, Terentius, on the revival of letters, was studied as a model by the most accomplished play-writers. His language is pure almost to being immaculate, and though inferior to Plautus in comic power, he is more than his match in consistency of plot and character, in tenderness, in wit, and in metrical skill. His plays have an educational value, as dividing, with the works of Cicero and Cæsar, the honor of being written in the purest Latin. They have been translated into most of the European languages. The best editions of his works are those of Bentley (Cambridge, 1726), and of Parry (1857).

TERESA, SAINT, one of the most remarkable of the female saints of the modern Roman calendar, and the most admired of the modern mystic writers of that communion, born at Avila, in Old Castile, March 28, 1515, was the daughter of Alfonso, of the noble house of Sanchez de Ceyeda. Even as a child, Teresa was remarkable for piety of a most enthusiastic kind; and when she was but seven years old, she and her little brother, Rodrigo, fled from her father's house, with the design of offering themselves for the crown of martyrdom among the Moors, but were overtaken and restored to their parents. Her mother died while she was still young, and she was educated in a convent at Avila, from which, however, she was compelled by illness to return home when she was in her 16th year. During her illness, she resolved, notwithstanding the very earnest opposition of her father, to become a nun, and having in her 18th year entered a convent of the Carmelite order in her native city, she made her solemn vow on the 3d of November, 1534. In this convent she continued to reside for nearly thirty years, but it was not until about the year 1539 that her constitution became strong enough to permit her to follow, even in an imperfect way, the observances of conventual life. Her own

account of her mental and spiritual condition during this period, which extended to the year 1555, is extremely interesting, and, like the confession of St. Augustine, and other saints, has furnished endless materials to the spiritualists of more recent times. The change of heart and of purpose came in 1555-1556, and was as complete and decisive as her former condition had been purposeless or fluctuating. After a time her religious exercises reached a most extraordinary degree of asceticism. Her prayers were almost continual, and she was reported to be favored with visions, ecstasies, and other supernatural visitations, of which many curious details are related by her biographers, and in her own letters and papers. The fame of her sanctity spread not only throughout Spain, but into almost every part of the church. By some, the reality of the reported supernatural favors which were ascribed to her were called into question; and there were even some who threatened to invoke the rigorous investigation of the holy office; but the popular voice was freely accorded to her, and the authority of St. Francis Borgia, St. Peter of Alcantara, and other high names eventually disarmed the opposition. The most notable and permanent fruit of the enthusiastic spirituality of Teresa is the reform of the Carmelite order, of which she became the instrument. She commenced this work in concert with a few zealous members of her own sisterhood in the convent at Avila, where she had resided from the date of her profession; but after a time, she obtained permission from the holy see, under the direction of Peter of Alcantara, to remove with her little community to St. Joseph's, a small and very humble convent in the same city, where she established in its full rigor the ancient Carmelite rule, as approved by Innocent IV. in 1247, with some additional observances introduced by Teresa herself. This new convent was established in 1562, and in the end of that year, or the beginning of 1563, Teresa took up her abode therein; and in 1565 she obtained from Pope Pius IV., a formal approval for the rule as modified by her. For two years Teresa lived in great privacy and quiet in her convent of St. Joseph; but in 1567, the general of the Carmelite order, F. Rubeo, was so struck, during his visitation of the convents at Avila, with the condition of that over which Teresa presided, that he urged upon her the duty of extending throughout the order the reforms thus successfully initiated. Teresa entered upon the work with great energy, and although she met with much opposition, nevertheless succeeded in carrying out her reforms. In 1579, the Carmelites of the stricter observance established by Teresa were released from the jurisdiction of the old superiors, and united into a distinct association, with a separate head and a distinct organization, which was approved in 1580 by Pope Gregory XIII. Under this new constitution, the association flourished and extended; and within the lifetime of Teresa, no fewer than 17 convents of women and 16 of men accepted the reforms which she had originated. Teresa died at Alba, October 4, 1582, in her 68th year. She was canonized by Gregory XV. in 1621, her feast being fixed on the 15th of October. She left a number of works, which have at all times maintained a high reputation among the spiritualists of her own church, and whose merits, in many respects, are acknowledged by non-Catholic writers. They consist of ascetical and mystical treatises, instructions in the conventual life, meditations, etc., besides a large number of letters, which possess remarkable literary merit, quite independent of their doctrinal character. Her works in the original Spanish fill two folio volumes, and they have been in the whole or in part translated into almost every European language. Her life occupies nearly an entire volume of the new continuation of the *Acta Sanctorum*; and several more popular biographies have been written in Spanish, French, Italian, German—the best-known English one being that by the Rev. Canon Dalton. See *Leben der heil. Theresia* von Dr. Fr. Pösl (Regensburg, 1847).

TERHUNE, MARY VIRGINIA (HAWES), b. N. Y., 1835; married, 1856, the Rev. Dr. Edward P. Terhune, pastor of Bedford ave. Reformed church, Brooklyn, N. Y., 1884-91; contributed at the age of sixteen to *Godey's Lady's Book* a sketch entitled *Marrying from Prudential Motives*, which was copied into an English paper, thence transferred to a French journal, retranslated into English, and published in England and America as an English story. Her publications are: *Alone*; *The Hidden Path*; *Moss Side*; *Husbands and Homes*; *Miriam*; *Nemesis*; *Sunnybank*; *Husks*; *The Christmas Holly*; *Ruby's Husband*; *Phemie's Temptation*; *Helen Gardner*; *The Empty Heart*; *Common Sense in the Household*, a book of domestic recipes; *Loiterings in Pleasant Paths*, etc. She is best known by her nom-de-plume of Marion Harland.

TERLIZZI, a flourishing, well-built town of Italy, in the province of Bari, 17 m. s.e. of Barletta, and 8 m. from the Adriatic. It contains a cathedral, a parish church, and three convents. Pop. '81, 20,442.

TERM, in legal phrase, has several meanings, but that best known is when it denotes certain days of the year for calculating rent between landlord and tenant, and which have been adopted by immemorial usage, owing to the convenience of thus terminating the contract between the parties. In England and Ireland the year is for this purpose divided into four quarters or terms. These are—Lady-day, Mar. 25; Midsummer-day, June 24; Michaelmas-day, Sept. 25; and Christmas-day, Dec. 25. In Scotland, the terms as between landlord and tenant are divided into legal and conventional terms. There are two terms recognized by common law, viz., Whitsunday, May 15; and Martinmas, Nov. 11; while other two conventional terms subdivide these, viz.,

Candlemas, Feb. 2; and Lammas, Aug. 1.—There is also a subdivision of the year into law-terms (q.v.), adopted and sanctioned by statute for the purpose of the sittings of the law-courts. These are Hilary, Easter, Trinity, and Michaelmas terms.—There is a third and technical meaning of the word "term," when it means an estate for years in land.

TERMINI (anc. *Thermæ Himærenses*), a seaport town on the n. coast of Sicily, 21 m. e.s.e. of Palermo, at the mouth of the river San Leonardo. It is built partly on a plateau (the summit of which is crowned by a castle—now a prison—of mediæval construction), and partly on the slope and in the hollow beneath. Termini, with its noble background of towering hills, and its magnificent view of the Mediterranean, well deserves the title of *La Splendidissima*, bestowed on it by the emperor Frederick II. Many of the inhabitants are engaged in fishing for tunny and anchovies. Pop. '81, 22,733.

The ancient *Thermæ* (of which Termini is an Italian corruption) was founded 408 B.C., after the destruction of the Greek city of Himæra, and whence its name Himærenses. Whether it owed its origin to the Carthaginians themselves, or to the surviving citizens of Himæra, is doubtful; but it soon passed under the authority of the former, who here defeated the Romans with heavy loss (260 B.C.) during the first Punic war. After Sicily became a Roman province, *Thermæ* was treated with peculiar consideration by its new masters, and became a flourishing place. Relics of the ancient city, as the baths (which are still used), fragments of a theater and aqueduct, are still visible; and numerous inscriptions, statues, etc., are preserved in public and private collections.—See B. Romano's *Antichità Termitane* (Palermo, 1838); Battaglia, *Storia di Termini* (Palermo, 1896 ff.).

TERMINUS, a Roman divinity, supposed to preside over public and private boundaries. Originally he appears to have been the same as Jupiter himself, but gradually he was recognized as a separate and distinct god. Hardly any religious conception is more thoroughly characteristic of the Romans, that land-loving, law-reverencing people, than the conception of Terminus, whose worship was practiced down to a late period.

TERMITE, or WHITE ANT, *Termites*, a genus of insects of the order *neuroptera* (q.v.), and of the family *termitidæ* or *termitinæ*. They live in great communities, chiefly in tropical countries, and are almost omnivorous, in the larva, and pupa, as well as in the perfect state. In their communities there are five classes—males, females, workers, neuters, and soldiers. The workers, neuters, and soldiers seem all to be imperfectly developed females. The males and perfect females have four wings, which are long and nearly equal, and which are often suddenly cast off before the termination of their life; but the greater part of the community consists of workers, which are wingless. The "soldiers" are larger than the neuters, and have very large mandibles, which they are always ready to use upon any assault. The antennæ of the genus *termes* are long and thread-shaped, with about 20 joints; the eyes are small and prominent, and there are three *ocelli*; the abdomen has a pair of minute caudal appendages. Most of the white ants make their nests on the ground, but some of them among branches of trees, decayed or dry wood forming a principal article of their food. The species which make their nests on the ground make them conical, or turret-shaped, often 12 ft. and sometimes even 30 ft. high, in groups, like a little village. The soil where the white ants have labored is particularly good, and the south Africans take advantage of its excellent quality. The nest is divided internally into numerous chambers and galleries; there are generally two or three roofs within the dome-shaped interior, and the thick walls are perforated by passages leading to the nurseries and magazines of food. If a breach is made in the building, the soldiers appear, ready for defense. White ants are very useful in consuming every kind of decaying animal or vegetable matter. They even eat grass, and the snapping of multitudinous mandibles has been likened to the sound of a gentle wind among trees. They sometimes attack the wood-work of houses, and soon reduce the thickest timbers to a mere shell. Extraordinary and incredible stories are told of their attacking and devouring large animals, but it seems probable that they do so only when the animals are helpless from age or sickness. They come in vast hosts to any place where food is to be found, and are not easily driven off; multitudes pressing on, although previous multitudes have been destroyed. They gather great stores of corn into their nests, of which the natives of Africa often avail themselves. They are themselves also used as food in Africa, and are said to be delicate and pleasant. The abdomen of the pregnant female termite becomes dilated to an extraordinary degree, so as to exceed the rest of her body 1500 or 2,000 times, and she is then about 1000 times heavier than the male insect. Her fecundity is prodigious; she is supposed to lay more than 31,000,000 of eggs in a year.

The termites which live in trees construct nests of great size, like sugar-casks, of particles of gnawed wood, cemented by a kind of gluten, and so strongly attached to the branches as not to be shaken down even by violent storms. These species sometimes take up their abode in the roofs of houses, where they are very destructive to the wood-work.

T. mordax and *T. atrox* are among the African ground-building species. *T. lucifugus* is found in the s. of Europe, and has proved very destructive in the navy-yard of Rochefort, and elsewhere in the s. of France. Sulphurous gases and chlorine are forced into its galleries, without effecting its extirpation. *T. flavicollis* is very injurious to olive trees in Spain. *T. frontalis* extends as far n. in the United States as Massachu-

setts, and does mischief in vineries, not only attacking dead wood, but the roots of living vines. No true species of *termes* is found in Britain, but some of the *termitidæ* are British insects. One of them is *psocus pulsatorius*, one of the insects which emit a sound like the ticking of a watch in houses. The species of the genus *psocus* are very small, active insects, living beneath the bark of trees, in wood, straw, among books, etc.

In books of travels, the termites are often called ants, their habits being similar, although they belong to a different order of insects. See *illus.*, BEETLES, ETC., vol. II., *figs.* 1-8.

TERN (*Sterna*), a genus of birds of the gull family (*laridæ*), by some made the type of a distinct family (*sternidæ*); having the bill as long as the head, or longer, nearly straight, compressed, slender, tapering; the wings long and pointed; the tail long and forked. The plumage is very full. From their forked tail, manner of flight, and small size, the terns are often called sea-swallows. They are incessantly on the wing, skimming the surface of the water, and catching small fishes and other small animals from it. The species are numerous, and are found in almost all parts of the world. Some of them are of very wide geographic distribution. Many are birds of passage. Thus, all which occur on the British coasts, and in other northern parts of the world, are mere summer visitants. The COMMON TERN (*S. hirundo*) is abundant on the more southern shores of Britain, but rarer in the north. It is found also on the coasts of Europe, Asia, and Africa, from the Arctic circle to the furthest s.; but there is some doubt if its range extends to America, where a very similar species, WILSON'S T. (*S. Wilsoni*), was long mistaken for it.

TERNANT, JEAN DE, Chevalier, 1750-1816, b. France; was with the French army in America during the revolutionary war. Baron Steuben made him one of his inspectors in 1778. He was afterward lieut. col. and inspector of troops in the south, was captured at the surrender of Charleston in 1780. After his exchange he returned to his former position in the south. He was a col. in the French army during the French revolution, and minister to the United States, 1790-93.

TERNATE. See **MOLUCCAS**.

TERNAUX, GUILLAUME LOUIS, Baron, 1763-1833, b. Sedan, France. When but a boy he became manager of his father's woolen mill, and by his business sagacity rescued its finances from ruin. He was a deputy to the assembly, 1818-23 and 1827-30. The revolution of 1830 was brought about by the position taken by Ternaux and his party, and by it he lost a large fortune. He introduced improvements in manufactures and wrote several treatises on financial and industrial subjects. His nephew, HENRI TERNAUX-COMPANS, 1807-64, was noted as a collector of old books, his library of works bearing on the discovery and conquest of America being the finest in existence. He published a *Bibliothèque Américaine*, 1493-1700 (1836).

TERNAY, CHARLES LOUIS D'ARSAE DE, 1722-80, b. France; entered the French navy in 1738. In 1762 in command of a squadron he attacked Newfoundland, and captured St. John's, and several British vessels. He was governor of the island of Bourbon, 1772-79. The next year he commanded the French fleet bringing over to America count Rochambeau and his forces. He died at Newport soon after his arrival.

TERNI (anc. *Interamna*) a t. of central Italy, on the right bank of the Nera (anc. *Nar*), a little below its confluence with the Velino, 49 m. n.n.e. of Rome. It is encircled by a wall, with towers and five gates, is well-built, gives name to an archbishopric, and possesses a cathedral, several fine palaces and churches, a hospital, theater, and various monuments of antiquity, as the ruins of an amphitheater, temples, and baths—none of which, however, are of much importance. Terni manufactures silk and woolen fabrics. Pop. (communal), '81, 15,853. About 2 m. from the town is the famous cataract of Velino, 500 ft. high, celebrated by Byron in his *Childe Harold*.

Ancient *Interamna*, according to classic tradition, was founded only 80 years after Rome, but we have no knowledge of its history until it ceased to be an Umbrian, and became a Roman city. About the time of Marius and Sulla, it was (according to Florus) one of the *florentissima Italia municipia*, but at no period did it occupy a very prominent position. Its chief claim to notice arises from its being regarded (by some) as the birthplace of the historian Tacitus, and of his descendant, the emperor of the same name.

TERNSTROMIA CÆ, a natural order of exogenous plants, allied to *guttifere*, and consisting of trees and shrubs, natives of warm and temperate countries. About 150 species are known. They are most abundant in South America; a few are found in North America; some in India, China, and other parts of the east; only one African species is known; and Europe produces none. The leaves are alternate, leathery, in many species evergreen, generally undivided, sometimes dotted. The flowers are on axillary or terminal stalks, generally white, sometimes pink or red; with 5 to 7 concave, leathery, deciduous sepals, and 5 to 9 petals, which are often combined at the base; many hypogynous stamens, which are either free or variously combined: 2 to 7 filiform styles, more or less combined: the fruit a 2 to 7-celled capsule, either opening by valves, or leathery and indehiscent, the seeds large, few, and attached to the axis, the cotyledons very large, and often containing much oil. This order is very important as containing the tea-

shrubs. It is also interesting because of the great beauty both of the foliage and flowers of many of the species, of which the genus *camellia* affords the best-known examples. See TEA, CAMELLIA, and GORDONIA.

TERPAN DER, a Greek musician who flourished in the beginning of the 7th c. B.C. He was born at Antissa in the island of Lesbos; went to Sparta, and in 676 was crowned victor in the first musical contest at the feast of Apollo Carneius. He established there the first musical school in Greece. He enlarged the compass of the lyre to an octave, and was the first who regularly set poetry to music.

TERSICH ORÉ (Gr. delighting in the dance), one of the nine muses (q.v.), presided over choral song and dancing.

TERRACINA (anc. *Tarracina*), a t. of central Italy, in what was formerly the Papal States, is situated on the coast at the s.e. extremity of the Pontine Marshes, near the mouths of the Ufente and Amaseno. It is the seat of a bishop, possesses a cathedral (built on the ruins of a heathen temple), a square with a handsome fountain, and on the summit of a precipice overlooking the town, the ruins of an imposing *Temple of Venus*, supposed, until the excavations of 1894, to have been a palace of Theodoric, king of the Goths. The harbor, a naval station of the Romans, is now filled up. Pop. '81 (communal), 8572.

Tarracina was originally a Volscian town, and was called by the Volscians *Anxur*, a name which is often applied to it by the Latin poets. It fell into the hands of the Romans, 400 B.C., became the seat of a Roman colony, 329 B.C., and as long as there public and empire lasted was a flourishing and important city. So closely do the mountains here approach the sea that there was scarcely room for the celebrated "Applan way;" hence the importance of Tarracina as a military position. Numerous ruins of the ancient town are extant.

TERRA or **TELLUS**, in classical mythology, one of the oldest of divinities, the earth-goddess, wife of Uranus, mother of Oceanus, the Cyclops, the Titans, the giants, Themis, Mnemosyne, etc. Her festival was on April 15, and sacrifices were offered to her in spring and autumn. She corresponds to the Greek Ge, called by Hesiod the first-born of Chaos.

TERRA COT'TA, an Italian term signifying *baked clay*. It is applied chiefly, if not altogether, to manufactures of brick-earth used for ornamental purposes, especially those used architecturally. Formerly it was not uncommon in Britain, particularly about the beginning of the 18th c.; but after the reign of Queen Anne it was discontinued, and was scarcely ever used until about the year 1860. A complete revival has now taken place, and this material has been applied with admirable effect in some of the buildings lately erected, especially the South Kensington museum and many public buildings in the United States.

TERRA DEL FUEGO, or **TIERRA DEL FUEGO** (Land of Fire), an archipelago situated at the extreme s. of South America, and separated from the main land by Magellan's Straits, bet. 52° 28'-55° 59' s. lat. and 63° 42'-74° 48' long. w. from Greenwich, with a total area of about 28,400 sq. miles. It consists of one principal island, King Charles's South Land, containing 21,300 sq. miles, or about three-fourths of the whole area, the seven islands Desolation, Clarence, Dawson, Hoste, Navarin, Wollaston and State island, and numerous islets, the most southern of which ends in Cape Horn. All the islands are very irregular and cut by deep fiords, affording magnificent scenery. The eastern coasts are as a rule level, while the western coasts are rocky and mountainous, forming the southern extremity of the Cordillera system. Some of the peaks are over 6000 feet high and partly covered with perpetual snow, but there are no active volcanoes. The eastern part of King Charles's South Land contains some good pasture land, while gold has been found in paying quantities. The climate is raw and cold, and violent rain and snow storms occur, especially from June to October. The natives, whose number is estimated at about 8000, belong to two distinct races, those in the northeast of the main island, the *Ona* tribe, being tall, well-built men, closely resembling in speech and habits the tribes north of Magellan's strait, while the Fuegians, properly so called, and the *Jahgan* and *Alacaluf* tribes on the islands further south are small of stature, with coarse features and long, straight hair, and occupy a low rank in the scale of humanity. Their food consists mainly of fish and shellfish, seals, berries, etc. Their language possesses no expressions for numerals above three, yet it has a highly developed grammatical structure, the verb possessing three subjunctive forms, an interrogative form, and a form expressing impossibility, while substantives are declined in four numbers, singular, dual, trial, and plural. The English South-American mission has had a station in Uschuia for some years, with over three hundred native Christians, who occupy themselves with farming and cattle-raising. By a treaty concluded July 23, 1881, Chile and the Argentine Republic divided Terra del Fuego between them, the Argentine Republic receiving that portion of the main island east of 68° 34' w. long., together with State island, thereby getting about 8000 sq. miles, while Chile's share was over 20,000 sq. miles. The Chilean division has been attached to the territory of Magelanes; that of the Argentine Republic forms the government Terra del Fuego, with three departments. The seat of government, formerly at Uschuia, has been transferred to Buen Suceso.

The island of Terra del Fuego was discovered by Fernão de Magalhães, in 1520, but, although often visited, was never systematically explored until after the political division of 1887, since which time they have been explored by Bossi, Bove, Lista, Popper, Rousson and Willem. From Sept. 5, 1882, to Sept. 1, 1883, the island Hoste was the seat of a French polar station. See Fossarieu, *Ethnographie de l'Amérique Antarctique* (Paris, 1884); Bove, *Patagonia, Terra del Fuego, etc.* (Genoa, 1883), Serrano, *Derrotero de Estrecho de Magallanes, Tierra del Fuego, etc.* (Santiago, 1891).

TERRA DI LAVORO (*Campania Felix*), now CASERTA, a maritime province of s. Italy, bounded on the n.w. by what was formerly the Papal states. Area, 2086 sq. m.; pop. '90, (est.) 732,810. This is the famous *Campania Felix* of the ancients. Pliny extols its beauty and its fine situation. Florus calls it the finest country in the world. In ancient times it was inhabited by the Ausonii, the Osci, and later by the Campani. The finest part of Campania has been separated from it, and is that fertile tract of country which surrounds the gulf of Naples; another part has been added to the province of Molise.

TERRA DI SIENNA. See BURN'T SIENNA.

TERRÆ FILIUS. A Latin phrase from which comes our English expression, "son of the soil." Cicero and Persius use the expression. In one of his letters to Atticus the former says: "I cannot venture to trust a letter on matters of such importance to this son of the soil, when goodness knows who he may be." Tertullian explains its significance: "The people call those persons *sons of the soil* whose pedigree is doubtful," as does also Minucius Felix: "We call the ignoble and unlearned, 'sons of the soil.'" The transition from this last to the English meaning is an easy one.

TERRA FIRMA, a term frequently employed to denote continental land as distinguished from islands. But it was at one time more specially applied—1st, to all the mainland of Italy which acknowledged the supremacy of Venice—viz., to the duchy of Venice, Venetian Lombardy, the march of Treviso, the duchy of Friula and Istria; 2d, to that extensive tract of South America bounded by the Pacific ocean, Peru, the silvas of the Amazon, the Atlantic ocean, and the isthmus of Panama, which mostly belonged to the Spaniards during the last century. In a still more restricted sense, the term was applied by the Spaniards to the isthmus of Panama itself. Colloquially, the phrase *terra firma* is applied (but erroneously) to land as distinguished from water.

TERRANOVA, a seaport town on the s. coast of Sicily, province of Caltanissetta, on the right bank of the Maroglio, 18 m. e. from Licata. Pop. '81, 17,173. The town carries on a considerable trade. Terranova is believed to occupy the site of the ancient Gela (q. v.). The town now standing was built by Frederick II. in the 12th century. In its neighborhood is the village of Mazarino, from which the famous cardinal took his name.

TERRAPIN, the popular name of many species of fresh-water tortoises, of the family *emydæ* (see EMYS), natives of tropical and the warmer temperate countries. The neck can be wholly retracted within the shell; the head is flat, and the jaws prolonged into a beak. They feed partly on vegetable food, but also devour fish, reptiles, and other aquatic animals. They swim very well, and even on land move with much greater swiftness than land-tortoises. Their flesh is generally much esteemed. Several species are natives of North America.

TERREBONNE, a parish in s.e. Louisiana; bounded on the s. by the gulf of Mexico, on the w. by Atchafalaya bayou, drained by Black, Caillou, Chene, and Terre Bonne bayous; traversed by the Southern Pacific railroad; about 1800 sq. m.; pop. '90, 20,167. The principal productions are corn, molasses, and sugar. Parish seat, Houma.

TERREBONNE, a co. in s.w. Quebec, lying n.w. of the isle of Jesus, having the St. Lawrence river for its s. boundary; 545 sq. m.; pop. '91, 23,128. It is drained by the North river, which empties into the Ottawa. It has saw, grist, and woolen mills. Co. seat, St. Jerome.

TERRE HAUTE, city and co. seat of Vigo co., Ind., on the Wabash river, and the Chicago and Eastern Illinois, the Cleveland, Cincinnati, Chicago, and St. Louis, the Evansville and Terre Haute, the Vandalia line, and several other railroads; 73 miles w. of Indianapolis. It is built on prairie land on a bluff 60 feet above high water, is underlaid with block and bituminous coal, is within a few miles of the great block coal mines of Clay co., and is surrounded by a fertile farming region. The city is handsomely and regularly laid out; has several public parks and squares, of which Collett (30 acres) and Deeming (80 acres) are the most attractive; and has electric lights, electric street railroads, waterworks on the Holly system, well-paved streets and good sewerage. Terre Haute contains the state normal school, the Rose polytechnic institute, Coates female college, Rose orphan home, St. Ann's orphan asylum, Union home for invalids, old ladies' home, St. Anthony's hospital (R. C.), St. Mary's institute (R. C.), and the Rose dispensary. Other noteworthy buildings and institutions are the U. S. government building, co. court-house, city hall, union railroad station, high school, and

public, law, and school libraries. There are over 30 churches, national, state, savings, and private banks, and several daily, weekly, and monthly periodicals. The U. S. census of 1890 reported for Terre Haute 367 manufacturing establishments, employing \$4,965,184 capital and 5205 persons, paying \$2,154,001 for wages and \$6,785,616 for materials, and having a combined output valued at \$13,720,529. The principal manufactures are rolling mills, blast furnaces, flour and hominy mills, distilleries, breweries, nail works, railroad car shops, tool factories, paving brick, and other clay works. There are also large grain elevators. The town was founded in 1816, and was chartered as a city in 1852. Pop. '90, 30,217.

TERRELL, a co. in s.w. Georgia, drained by the Flint river and its creeks; traversed by the Central of Georgia railroad; about 320 sq. m.; pop. '40, 14,503. Co. seat, Dawson.

TERRE-PLEIN, in fortification, is the flat surface of the rampart, on the front portion of which the parapet and banquette are formed, and of which the rear slopes down to the general level of the inclosure.

TERRESTRIAL MAGNETISM. In the article **MAGNETISM**, it is shown that the earth itself is to be considered as a great magnet; and in the present article it is proposed to exhibit the chief results of observation on the earth's magnetism as seen in its action on artificial magnets. That action is simply *directive*; that is, it determines the way in which the magnet shall point, but has no tendency to translate or move it bodily. Terrestrial magnetism acts differently at different places; what are called the *magnetic elements* of a place are the direction of the needle in regard to the points of the horizon (*variation or declination*), its direction in regard to the vertical (*inclination or dip*), and the force that keeps it in these positions (*intensity*). For the first two elements, see DECLIN-

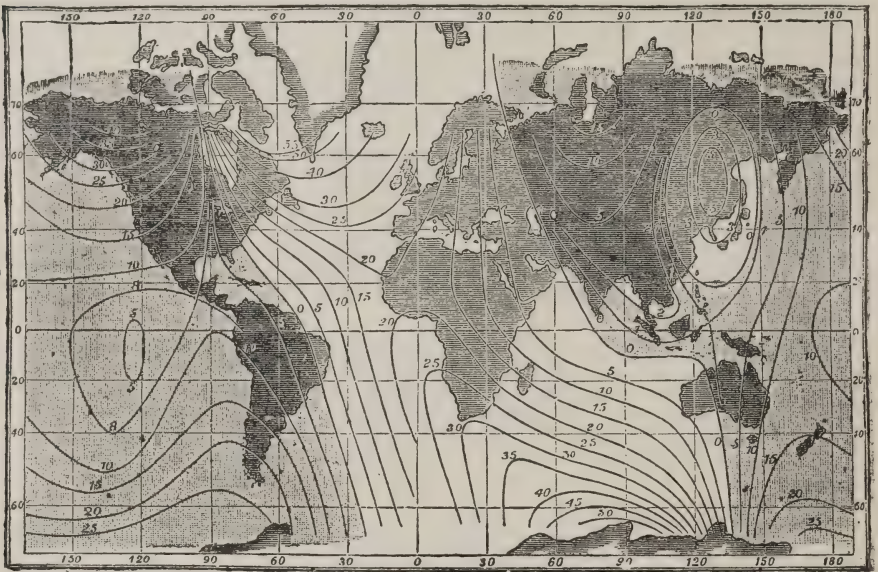


FIG. 1.

ATION-NEEDLE and DIPPING-NEEDLE. The element of intensity is more difficult to determine. The relative horizontal intensity is measured by the number of oscillations that a needle, of unit size and strength, when disturbed makes in a given time, the intensities of two places being as the squares of the oscillations. The total intensity is got by dividing the horizontal intensity by the cosine of the angle of dip. Gauss has succeeded in reducing this measurement from a relative to an absolute standard.

Magnetic Charts.—The magnetic elements have been ascertained with great care at different portions of the earth's surface. The knowledge thus obtained has been embodied in magnetic charts, in which the points at which the declination is the same are joined by lines, and similarly those where the dip and intensity are alike. The lines of equal declination are called the isogonic lines; those of equal dip, isoclinic; and those of equal intensity, isodynamic lines. As the magnetism of the earth is subject to a slow secular variation, such charts are only true for the time of observation. The chart, fig. 1, was drawn up by col. Sabine for the year 1840, and gives an approximate view of the lines of equal declination for that year. The change since 1840 has been small, so that an isogonic chart for the present time would differ but slightly from it. The chart sufficiently explains itself. Attention may, however, be given to one or two points. The declination is marked on each line. Thus, the line passing through England, for instance, is marked 25°, and that passing n.w. of the British islands, 30°. At places under those lines the needle points to a n. 25° and 30° w. of the true north. On the space intervening

between these lines, including Scotland and Ireland, a correction, varying from 0° to 5° , must be made according as the station lies more toward the one line than the other. The westerly line of no declination passing northward cuts off the eastern corner of South America, proceeds to North America, which it enters at North Carolina, traverses the continent by lakes Erie and Huron and the w. of Hudson's bay, and ends in the n. of the continent at Boothia. The easterly line of no declination passing southward enters Europe in the n. of Russia, crosses the White sea to the e. of Russia, of the Caspian sea, of Persia, and the Arabian sea; then turns eastward, and cutting off the w. of Australia, passes southward. The space included between those two lines, and which in the chart is left untinted, constitutes, so to speak, the hemisphere of westerly declination. It includes the e. of the two Americas, the Atlantic ocean, the whole of Europe and Africa, and the w. of Asia and Australia. The rest of the earth, which in the chart is tinted, has an easterly declination. There is an elliptic space in Eastern Asia which is left white, having a westerly variation, and forms an exceptional region in the eastern magnetic hemisphere.

It will be seen that the lines converge in the n. of North America, and in the s. of Australia. So far as experience goes, and so far as the most matter-of-fact theory (Gauss's) teaches, the convergence in both cases is to a point. The point in North America is the *north magnetic pole*, and that s. of Australia is the *south magnetic pole*. At these points, then, all isogonic lines converge, and a compass-needle lies indifferently in any position.

These isogonic lines, as seen from the chart, form a somewhat complicated system. This arises from the fact that we refer the indications of the needle to the geographical poles, which are, so far as we know, arbitrary or extraneous as regards terrestrial magnetism. Duperrey, by drawing what he calls *magnetic meridians and parallels*, draws a system of lines which have much the same conformation with regard to the magnetic poles that the meridians and parallels of latitude have to the geographical poles. A magnetic meridian, according to Duperrey, is the line that would be described by a person setting out, say from the south magnetic pole, and traveling always in the direction of the magnetic n. till he reached the n. magnetic pole. The magnetic parallels are lines drawn at right angles to the magnetic meridians.

In an isoclinic chart by the same author and for the same epoch in the upper part of the chart, which is left white, the n. end of the needle dips; and in the lower part, which is tinted, the s. end of the needle dips. The amount of dip is marked on lines. Thus, the line passing through the center of England is marked 70° . A dipping-needle, at any place cut by the line, is inclined 70° to the horizon. The line 75° passes to the n. of the British isles. In Ireland and Scotland, therefore, the dipping-needle has an inclination greater than 70° , and less than 75° . The line marked 0° is the line of no dip; at any station on it the dipping-needle is horizontal. This line is called the *magnetic equator*. It is not coincident with the geographical equator; it is not even a great circle of the earth, but is an irregular curve cutting the equator in two points, one near the w. coast of Africa, and the other in the middle of the Pacific ocean. The points on the earth's surface where the dipping-needle stands vertical, and where, in consequence, as before mentioned, the compass-needle lies in any direction, are called the magnetic poles. The n. magnetic pole was found in Boothia Felix by capt. Ross at $70^{\circ} 5' \text{ n. lat. and } 263^{\circ} 14' \text{ e. long.}$ According to Gauss's calculation, it should have been at the time (1831) some 3° n. of this point. From observations made at Hobart Town, the nearest station to it, the s. magnetic pole should lie $66^{\circ} \text{ s. lat. and } 146^{\circ} \text{ e. long.}$ These points are not diametrically opposite each other, as the geographical poles. If the lines of equal dip were drawn on a globe, they would form round the magnetic poles a system of irregular circles, somewhat resembling that of the parallels of latitude round the poles of the earth.

We do not add an isodynamic chart, as it would take up too much space. Col. Sabine's dynamical chart, along with the isogonic and isoclinic charts, will be found fully engraved and explained in Johnston's *Physical Atlas* (new edition). From this chart we learn that the magnetic intensity is least in the vicinity of the magnetic equator, and increases as we approach the magnetic poles. The lines of equal intensity, though running much in the same direction as the lines of equal dip, are neither coincident nor parallel with them. The line of least intensity, itself not an isodynamic line, runs nearly parallel to the magnetic equator, but lies, except in the western half of the Pacific, a few degrees to the s. of it. We thus learn that the changes in direction and intensity do not march together. We should fancy that at that point or points on the earth's surface where the dipping-needle stood erect we should be nearest to the center of free magnetic energy, and that there the force would be greatest; but this is not the case. The point in North America where the intensity is greatest is situated to the w. of Hudson's bay, some 18° s. of the n. magnetic pole. But this is not the only point of maximum force in the n. magnetic hemisphere. There is another, which was found by Hansteen in 1828, in Northern Siberia, about the longitude 120° . This maximum point is weaker than the American, in the proportion of 100 to 107 (Sabine). According to Gauss, there can only be one maximum point in the southern hemisphere which is stronger than either of the other two. It lies n.e. of the s. magnetic pole, and its intensity is 137 (Gauss) compared with 107, that of the principal northern center. At none of those

points does the dipping-needle stand erect. This want of coincidence of the points of vertical dip and of maximum intensity has led to some confusion in the use of the term magnetic pole; some writers meaning by it a point of vertical dip, and others a point of maximum intensity. In adopting the former definition we are only adhering to the popular meaning of the word, and to the opinion of Gauss, perhaps the greatest authority on the subject. Some of the best English authorities, however, attach to it the latter meaning.

Although the total intensity increases as we go northward or southward from the line of least intensity, the horizontal intensity diminishes. This arises from the fact that the greater the dip the less the horizontal intensity. Hence the compass-needle, which is affected alone by the horizontal intensity, oscillates more sluggishly as we leave the line of least intensity. A dipping-needle, for instance, oscillates faster at London than at Calcutta, because the total intensity which affects it is greater at London than at Calcutta; but with a compass-needle it is the reverse, from the horizontal intensity being greater at the latter than at the former station.

Variations of the needle.—The magnetic elements do not remain constant in the same place, but are subject to continual though small variations. These are regular and irregular. Under regular variations are included *secular*, *annual*, and *diurnal* variations. The secular variations take centuries for their completion. The following list of the declination and dip at London in different years will give an idea of the secular variations for these elements:

| Year. | Declination. | Year. | Inclination. |
|--------------|-----------------------|-----------|--------------|
| 1576..... | 11° 15' easterly. | 1720..... | 74° 43'. |
| 1657–62..... | 0° 0' no declination. | 1780..... | 72° 8'. |
| 1760..... | 19° 30' westerly. | 1800..... | 70° 35'. |
| 1815..... | 24° 27' 18" westerly. | 1830..... | 69° 38'. |
| | MAXIMUM. | 1850..... | 68° 48'. |
| 1850..... | 22° 29' 30" westerly. | 1865..... | 68° 9'. |
| 1865..... | 21° 6' “ | 1875..... | 67° 47'. |
| 1875..... | 19° 33' “ | 1882..... | 67° 31'. |

At present the annual decrease of declination at Kew is 8'. At this rate it would take rather more than 84 years for the compass-needle to shift through a whole point. From the observations of the dip we find that it has been gradually decreasing for the last 150 years. The annual decrease of dip is at present about 2.6'. The time during which observations have been taken of the declination and dip is far from comprehending a cycle of change in either, and it is a mere matter of speculation how long that may take. The magnetic history of London does not apply to other places, each place, so far as has been ascertained, having a magnetic history of its own. Thus, in Paris, the time of no declination was 1669; and of maximum declination, 1814; the latter amounting to 22° 34' west. Every place, according to Barlow, appears to have its own magnetic pole and equator. Magnetic intensity has been observed for so short a time that little as yet is known of its secular variation. At present the horizontal intensity is increasing in Europe, but that may arise partly from decrease of dip.

The magnetic elements are also subject to changes, which have a yearly and a daily period. In describing these shortly, we shall limit ourselves to the changes affecting declination, as these are of most general interest. The following are the chief particulars of the *annual variation* of declination given by Cassini: From April to July, or from the vernal equinox to the summer solstice, the western declination decreases. From the summer solstice to the vernal equinox, that is, during the other nine months of the year, the declination increases, the needle turning to the west. Its position in May and in October is nearly the same; so that in the winter months, from October to April, the westerly motion is slow. The range of the annual variation at Kew is 58'.85.

The mean *diurnal variation* for Kew is shown in fig. 2. The irregular line indicates the course of the n. end of the needle. A rise of this line indicates a change of the n. end to the e.; a fall, a change to the west. The interval between two horizontal lines corresponds to a deflection of the needle 1' to the e., and a fall 1' to the west. The line marked *o* is the magnetic meridian, or the mean daily position of the needle. The interval between two upright lines corresponds to an hour. The course begins at twelve at night, and ends at twelve the following night. At twelve at night, the magnet is 1½' e. of the mean position, and continues nearly in the same position, with only a slight westerly deviation, till 15 hours (three in the morning), when it veers eastward. At 20 hours (eight in the morning), it reaches its furthest e. point. From eight in the morning till one in the afternoon, it makes a sweep of 10' toward the w., and then stands about 6' to the w. of the mean. After one, it goes westward till midnight, when it again begins the same course. The needle stands in its mean position a little after ten in the morning, and a little before seven in the evening. The course here described is the course for the year. But the diurnal range is different in different months. In May, for instance, the average range between the extreme points is 12', which is the maximum range for the year; and in December, when it is a minimum, it is only 5' 28". The diurnal changes here described for Kew are much the same all over the n. magnetic hemisphere. The amount, however, is different. Near the magnetic equator the diurnal variation is little

or nothing, and it increases as we go northward. Captain Duperrey states that at or near the magnetic equator, the n. point of the needle in the morning shifts slightly e. or w. of the mean, according as the sun passes s. or n. of the station. In the southern magnetic hemisphere, the daily motions of the needle take place much in the same way as in the northern hemisphere, only the s. pole takes the place of the n. pole, and the direction of the deflections is reversed. The correspondence, and at the same time opposition, of the southern hemisphere is also shown from the time of maximum and minimum range. When the sun is in the northern signs of the zodiac, the range is a maximum in the northern, and a minimum in the southern hemisphere; and when the sun is in the southern signs, the reverse takes place. The diurnal variation is so small, that the ordinary compass-needle is not delicate enough to show it.

The *irregular variations* are those which break in upon the regular march of the diurnal variation, without in the main altering it. Instead, for instance, of the needle steadily going westward from 8 A.M. to 1 P.M., as shown in fig. 2, it makes, when affected by irregular variation, deflections eastward as well as westward, although it in

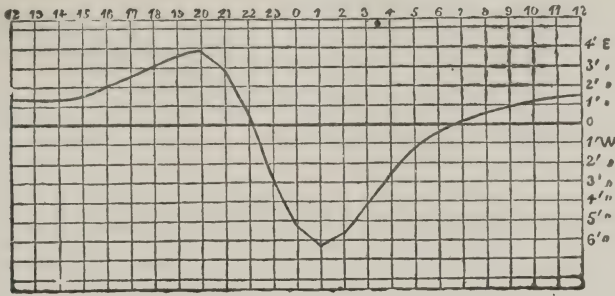


FIG. 2.

the main moves westward; so that the line between these hours, instead of being comparatively straight, would be an irregular zigzag. These disturbances of the mean course are sometimes considerable, amounting even to one or two degrees in extreme cases. On some days, the mean diurnal course is much disturbed, on others, very little; but it is never quite free from them. It has been found that places of the same longitude have similar disturbances at the same time; that those on opposite sides of the globe, or differing by 180° of longitude, have disturbances equal in amount, but opposite in direction; and that those situated 90° w. or e. of the disturbed regions, have little or no disturbance. The appearance of auroras is invariably accompanied by magnetic irregularities, and their effect extends far beyond the regions where they are visible. Earthquakes and volcanic eruptions have also a marked effect in this way. Humboldt gave the name of *magnetic storms* to these irregular disturbances. The frequency of these storms, and the amount of the diurnal variation, are found to be the greatest when sun-spots are most numerous. See SUN.

1. *Theories of Terrestrial Magnetism.*—The earliest theory was that suggested by Gilbert, in which it is supposed that a magnet in the middle of the earth extends from one magnetic pole to the other. On this supposition, the general phenomena of terrestrial magnetism may be accounted for—a needle, both by declination and dip, must point to the poles. This must always remain, from its simplicity, the popular theory on the subject. In consistency with his theory, Gilbert considered the n. pole of the magnet to be a s. pole, as he took the n. pole of the earth for his standard n. pole. If this theory were correct, the magnetic equator would be a great circle of the earth, and the magnetic poles would be 90° from it, which is far from the case. It is only a rough approximation to a just theory.

Halley endeavored to supplement Gilbert's theory by supposing two magnets of unequal strength crossing each other at the earth's center to be the cause of terrestrial magnetism. The theory of the two magnets or four poles was ably defended by Hansteen.

Barlow considered that the earth acted on the needle as if currents of electricity traversed it from e. to west. He imitated its action by wrapping a wire in parallel coils round a wooden globe, and causing a galvanic current to pass through it. Each turn of the wire represented a magnetic parallel, and the two ends of the coil the magnetic poles; and, to complete the analogy, the globe was movable on an axis, which stood in the same relation to the ends of the coil as the astronomical to the magnetic poles of the earth. When a small needle was placed on the globe, its declination and dip bore a striking resemblance to those of a needle similarly situated on the earth's surface. The objection to this theory is the difficulty of accounting for the origin of such currents in

the earth. To meet this, some suppose the earth to be a huge thermo-electric pile; and the heat of the sun falls on one side of it, currents are there generated which travel round the globe. But how, again, it may be asked, are the conditions of thermo-electricity implemented by the materials of the earth? This question still remains to be answered. The close connection between temperature and magnetism is shown by the diurnal variation of declination, the epochs of which closely correspond with those of the daily temperature, and by the fact that the isodynamic and isothermal lines manifest a marked correspondence. Sir David Brewster has also shown that there are two centers of maximum cold in the northern hemisphere, which are situated near to the two intensity poles.

Gauss did not start from any simple supposition of one or two magnets giving rise to the magnetism of the earth, nor did he assert or deny its electric origin. Considering the whole earth as magnetic, he aimed at determining how it must act as a whole at the different points on its surface. In order to make the equations he obtained theoretically in this attempt express the distribution on the earth, the magnetic elements of eight stations at a sufficient distance from each other on the earth's surface had to be ascertained and substituted in these equations. This done, from the longitude and latitude of any station he considered himself prepared to deduce its magnetic elements. The magnetic charts which he sketched, though founded on the imperfect observations to which he had access, are singularly in keeping with fact, and go far to establish the correctness of his reasonings.

The secular variations are as yet wholly unaccounted for. The cause of the diurnal variation is universally attributed to the sun. Secchi, who carefully studied the diurnal variation of the needle, considers that the sun, so far as they are concerned, acts upon the earth as a powerful magnet at a distance.

Historical Sketch.—The discovery of the change in declination at different places is generally attributed to Columbus, and was one of the many important observations of his memorable voyage across the Atlantic. Robert Norman, an instrument maker in London, first discovered the dip of the needle in 1576. He was led to it by finding that needles nicely balanced before magnetization had to be slightly loaded on the s. end, to keep them horizontal after being magnetized. Gilbert (1600) gave the first theory of terrestrial magnetism, viz., that of the single magnet. Halley, the astronomer-royal, published his theory of the four poles in 1683. In 1688 and 1689, at the expense of government, he made two magnetic voyages, the results of which he embodied in his charts of the lines of equal declination, published in 1701, which were the first magnetic charts ever published. In 1722, the diurnal variation was discovered by Graham, the celebrated instrument-maker of London. The first inclination chart was published by Wilke at Stockholm, 1768. Humboldt inaugurated the present system of careful observations of terrestrial magnetism by taking comparative measurements of the magnetic elements at Peru and Paris (1799–1803). Hansteen's work on the *Magnetism of the Earth* was published at Christiania, 1817; in 1826 he published the first isodynamic charts. Barlow (1831) suggested the electric origin of terrestrial magnetism. In 1831, captain Ross came upon the n. magnetic pole. In 1835, stations were established throughout Europe, and the observations were published by Gauss and Weber, 1836. Gauss (1833–1840) perfected his theory. In 1837, Col. Sabine published an isodynamic chart of the whole globe. Observations were made (1840–1854) at stations throughout the British empire by British officers, under the direction of Col. Sabine.

TERRESTRIAL TEMPERATURE. The distribution of heat over the globe is represented by isothermal lines, or lines drawn through all places having the same mean temperature.

The part of the globe having the highest mean annual temperature forms an irregularly shaped belt, lying along the equator, and comprised between the n. and the s. isothermals of 80°. On either side of this warm belt the temperature diminishes towards the poles; and the lines in a chart showing successively this diminution are, speaking in a very loose sense, arranged parallel to the equator, thus showing the all-predominating influence of the sun as the source of terrestrial heat. The coldest portion of the earth's surface is a small oval-shaped patch near to but not surrounding the n. pole, its mean temperature being —4°. Its narrowest diameter lies n. and s., nearly touching the pole on the one side, and extending on the other as far s. as 72° 30' n. lat. in 130° w. long. On looking at a chart representing the isothermal of 0°, one might be led to suppose that there are two centers of greatest cold, one n. of Siberia, and the other n. of British America. Such, however, is not the case—the apparent double center of greatest cold being solely due to the isothermals being drawn on Mercator's projection of the earth; for if an isothermal map be drawn on a polar projection, the lines of mean annual temperature inclose one connected space of greatest cold, and not two such spaces, as is not unfrequently stated.

While the decrease of temperature in advancing toward the poles corresponds in a general way to what may be called the solar climate, there are deviations brought about by disturbing causes too important to be overlooked. These disturbing causes are (1) the currents of the sea; (2) the prevailing winds; and (3) large surfaces of water which are frozen during part of the year.

The influence of an oceanic current depends on the temperature of the place it leaves and the place at which it arrives. Hence the great equatorial current, flowing from east to w. does not require to be considered here, because the heat remains the same throughout its course; but only those currents which convey the waters of the sea to higher or to lower latitudes. Of these, the most marked and important is the Gulf stream in the North Atlantic, which, by conveying warm water to the arctic regions, pushes the isothermals many degrees to the northward. There is a similar, though much feebler, current passing from the North Pacific to the Arctic Sea through Behring's strait, and there, accordingly, the isothermals are pushed a little to the northward. In the southern hemisphere, there are two currents, one discovered by Humboldt, passing from the Antarctic Ocean northward by the coast of Peru as far as Lima; the other flowing from the cape of Good Hope northward along the w. coast of Africa: these currents, flowing from colder to warmer latitudes, lower the temperature, and thus drive the isothermals toward the equator. Again, the great equatorial current, after impinging on the e. coast of Africa, turns southward, and by the warmth it imparts, pushes the isothermals into higher latitudes. For the same reason the current flowing southward past the coast of Brazil, raises the temperature in the e. of that country. The influence of these great currents is more distinctly marked in the forms of the isothermals for January and July. Thus, in January, when the relative excess of the temperature of the Gulf stream is greatest, the isothermals are driven very far to the north; and similarly in the southern hemisphere, the currents from the Antarctic Ocean being coldest in July, the isothermals are deflected more toward the equator during that month. The most remarkable lowering of the isothermals occurs in Labrador and Newfoundland during May and June, and is caused by the icebergs which then descend on these coasts from Davis's strait.

Since winds bring with them the temperature of the regions they have crossed, the equatorial current is a warm wind, and the polar a cold wind; also winds arriving from the ocean are not subject to such variation of temperature during the year as winds from a continent. As an atmosphere loaded with vapor obstructs both solar and nocturnal radiation, it follows that moist winds are accompanied with a warm temperature in winter, and a cool temperature in summer; and dry winds with cold winters and hot summers. The direction of mountain-ranges is also an important element to be taken into account in estimating the influence of winds on temperature. These considerations explain the position of the isothermals in the north temperate zone, where the prevailing wind is the s.w. or anti-trade (see WIND). In January, the western parts of each continent enjoy a comparatively high temperature, from their proximity to the ocean, whose high temperature the winds waft thither; and they are further protected from extreme cold by their moist atmosphere and clouded skies. But in the interior of the continents it is otherwise; for the winds getting colder as they advance, and being deprived of their moisture as they cross the mountains in the w., the soil is exposed to the full effects of radiation during the long winter nights, and as a consequence, the temperature rapidly falls. In the center of Siberia, the January temperature falls to -40° , which is 9° colder than the coldest part of the American continent; and this center of greatest cold lies near the eastern part of the continent of Asia. On the other hand, in July, the interior of continents is much warmer than their western parts. Hence the interior and eastern parts of Asia and America are characterized by extreme climates, and the western parts by equable climates.

The great fresh-water lakes of North America—lakes Superior, Huron, Erie, Michigan, Ontario, Bear lake, etc.—exercise an important influence on the climate of the central parts of North America, for in winter, America, with its frozen lakes, is a truly unbroken continental mass, and its winter climate is therefore continental; whereas in summer its numerous large sheets of fresh water communicate to it many of the features of an insular summer climate.

The whole effect of the disturbing causes is seen at once, if we compare the observed temperature of a place with its normal temperature, that is, the temperature due to it in respect of its latitude. In the northern hemisphere, in January, the sea and the western parts of the continents are in excess of their normal temperature; elsewhere, there is a deficiency. There are two centers of excess, one to the n.e. of Iceland, amounting to 41° ; the other in Russian America, amounting to only 18° ; and two centers where the temperature is deficient, one at Irkutsk, amounting to 41° ; and the other w. of Hudson's bay, amounting to 27° . In July, the United States, Europe, Asia, the Indian ocean, the n. of Africa, and the extreme n. of South America, have their temperature in excess, while elsewhere it is deficient. The centers of excess are: n. of Siberia, $13^{\circ}.5$; Red sea, $11^{\circ}.0$; and n.w. of the United States, $4^{\circ}.5$; and the centers where the temperature is deficient are: the entrance to Hudson's bay, $11^{\circ}.0$; and the Aleutian islands, $11^{\circ}.0$.

TERRIER, a small kind of dog, remarkable for sagacity, vivacity, courage, and eagerness in the pursuit of "vermin," which it readily follows into burrows; whence apparently the name terrier, from Lat. *terra*, the earth. The courage of the terrier, however, is such that it will readily attack animals much larger than itself; and it has been observed in India that terriers will fearlessly rush at the largest carnivora, when even the bull-dog hesitates. Terriers are of great use for killing rats in places much infested by them. They are also used for compelling the fox to leave his retreat; and a large

variety called the *saufinder*—that is, boar-seeker—is employed in Germany to rouse the fiercest beasts of the forest from their lairs. The varieties of terrier are numerous. In Britain, two are particularly prevalent, known as Scotch and English terriers—the former with long, rough, wiry hair, with which even the face is much covered; the latter with smooth, short hair. The ears are either erect and pointed, or have pendent tips. The Skye terrier is a breed of Scotch terrier, peculiarly prized. The BULL TERRIER is probably a cross between the terrier and the bull-dog (q.v.).

TERRITORIES, in the United States and under similar governments, are those portions of the public lands set off by congress and still under its direct authority, while having the capacity to become states whenever congress gives its consent. Each territory has a governor, a judiciary, and other administrative officers appointed by the president; and has a territorial legislature, the exercise of whose powers, limited in their degree, is subject to congressional revision. Usually, as soon as a territory has a population sufficient to entitle it to a representative in congress, it is empowered by act of congress to adopt a state constitution, whereupon it is admitted into the union. See ADMISSION OF NEW STATES.

TERRY, a co. in the Staked Plain of Texas; formed, 1876; unorganized, and attached to Martin co. for judicial purposes; 900 sq.m. Pop. '90, 21.

TERRY, ALFRED HOWE, b. Conn., 1827; educated at the Yale law school. He was clerk of the Connecticut superior and supreme courts, 1854-60; col. of a Conn. regiment at the beginning of the war of the secession; and took part in the first battle of Bull Run. In command of another Conn. regiment he was at the capture of Port Royal. He took command of Fort Pulaski after its capture; was made brig. gen. of volunteers in 1862, took part in the operations around Charleston, and at Forts Sumter and Wagner. In 1864 he led a division of the army of the James, participated in the Virginia campaign, and was at Bermuda Hundred and the siege of Petersburg. He led a second expedition against Fort Fisher in 1865, and took it by storm Jan. 15. He was soon made a brig. gen. in the regular army, and maj. gen. of volunteers for this victory. He assisted in the capture of Wilmington, and commanded the 10th corps during the North Carolina campaign; on the death of Gen. Hancock, was made maj.-gen., U.S.A.; died Dec. 1890.

TERRY, ELLEN ALICE (Mrs. E. A. WARDELL), was b. at Coventry, England, Feb. 27, 1848; and made her first appearance on the stage during Charles Kean's Shakespeare revivals in 1858, playing the parts of Manilius in *The Winter's Tale* and Prince Arthur in *King John*. When only fourteen she was a member of Mr. Chute's Bristol company, which included Mrs. Kendal and several other now prominent members of the profession. She made her debut in London, March, 1863, as Gertrude in *The Little Treasure*, and until Jan., 1864, played Hero in *Much Ado about Nothing*, Mary Meredith in *Our American Cousin*, and other secondary parts. In that year she married and left the stage, but reappeared again in Oct., 1867, in *The Double Marriage*, at the new Queen's theater, London. She afterwards joined Mr. and Mrs. Bancroft at the Prince of Wales's theater, where she acted the part of Portia. On Dec. 30, 1878, she made her first appearance at the Lyceum, and has since, in conjunction with Sir H. Irving, played in the longest runs ever known of *Hamlet*, *The Merchant of Venice*, *Romeo and Juliet*, and *Much Ado about Nothing*. She has also appeared as Viola in *Twelfth Night*, Henrietta Maria in *Charles I.*, Camma in Tennyson's tragedy of *The Cup*, and Ruth Meadows in *Eugene Aram*. She achieved immense success as Marguerite in W. G. Wills' play of *Faust*. She accompanied Sir Henry on his American tour in 1887 and many times thereafter, and afterwards reappeared at the Lyceum in *Faust*, and (1888) at the same theater played as Lady Macbeth and in *Dead Heart*. In Sept., 1890, Miss Terry appeared as Lucy Ashton in *Ravenswood*, with great success.

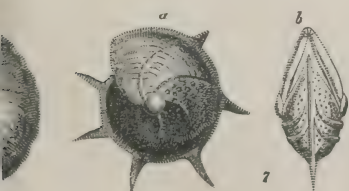
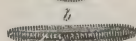
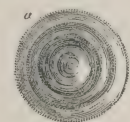
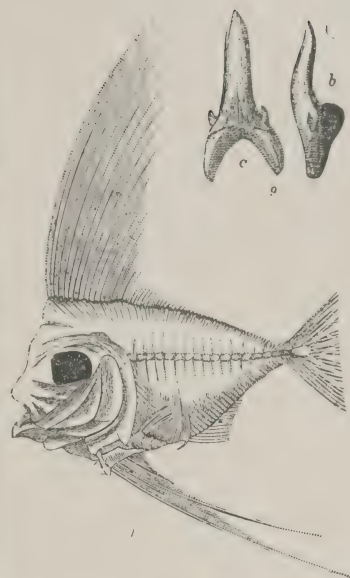
TERSCHELLING, one of the chain of islands to the n. of Holland, lies in 53° 24' n. lat., the principal villages being Hoorn, Westerschelling, and Midsland. It consists of fertile, arable, and meadow lands, is protected on the s. by large dykes, and in other parts by downs, which are carefully preserved. Area about 45 sq. m. Pop. '89, 3730. There is a good haven, a shipbuilding-yard, woolen dyeworks, etc.

TERTIAN FEVER. See AGUE.

TERTIARY (Lat. *Tertiarius*, one of the third rank), a name given by church writers to a class in the Roman Catholic church, who, without entering into the seclusion of a monastery, aspire to practice in ordinary life all the substantial obligations of the scheme of virtue supposed to be laid down in the gospel. Whatever earlier traces of this institution may be observable, there is no dispute that it was under St. Francis and the mendicant orders generally that the institute of tertiary, reached its full development. The rules of the institution of tertiary, such as they have since substantially been maintained, were made public in 1221. The associates must, of course, all be members of the church; and it is moreover required that all shall be of good repute and blameless life. The intending members must restore all ill-gotten goods, must renounce all evil practices, and abandon all feuds and enmities with their neighbors. Wives cannot be received without the consent of their husbands. The obligation of tertiary once accepted, is irrevocable, unless the party should be released, or should enter into a more strict religious order. The members are required to renounce luxury



TERTIARY PERIOD.—I. *Semophorus velicans*. 2. *Zeugloden* (eocene). 3. Landscape of the Paris basin. 4. *Robulina echinata*. 5. *Telephusa speciosa*. 6. *Lamna Hopei*. 7. *Palæorhynchum latum*. 8. *Zeugloden* (eocene). 9. *Robulina echinata*. 10. *Telephusa speciosa*. 11. *Lamna Hopei*. 12. *Palæorhynchum latum*.



Miocene period. 4. *Cerithium giganteum*. 5. *Andrias Scheuchzeri*. 6. Nummulites
 ne of a sequoia. 11. *Carinaria Hugardi*. 12. Nummulites. 13. Tertiary shells from the

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of life, profane exercises and amusements, costly or unseemly dress, and the use of arms, except in the necessity of self-defence. They must frequent the sacraments: hear mass, if possible, daily; observe the fasts of the church, as well as certain special austerities; avoid contention, litigation, and unnecessary oaths; cultivate charity toward all, with special obligations toward needy, sick, or afflicted brethren, and practice with more than common fervor the great Christian virtues. The tertiary are placed under the authority of superiors elected at intervals, and for a stated period, and are liable to an annual visitation, conducted by a priest appointed for the purpose. It is to be observed, however, that none of these obligations were supposed to bind the members under pain of mortal sin.

TERTIARY, the term applied in the science of geology (q.v.) to all the strata of the earth's crust above the cretaceous rocks, with the exception of those superficial beds which have recently been raised to a distinct group, under the title of the quaternary system, or recent period. There is considerable difference of opinion as to the division-line between the two systems, some including the boulder clay and its associated beds in the one, and some in the other group. Tertiary is synonymous with *cainozoic*, and is divided into the *pleistocene* (q.v.), *miocene*, and *eocene* (q.v.) periods.

TERTULLIAN, a father of the church, and one of the earliest who used the Latin language in written compositions. In one passage, the genuineness of which there is no reason to doubt, he calls himself *Septimius Tertullianus*. The best manuscripts call him *Quintus Septimius Florens Tertullianus*. He was the son of a proconsular centurion—that is, a centurion who attended on the proconsul. He was born in Carthage. He was brought up a heathen, and from his own writings we learn that he was licentious in his conduct, and fond of the public shows. We know nothing more of his heathen life. Eusebius describes him as a man exceedingly well acquainted with the laws of the Romans, and his writings bear out the assertion. From this circumstance, some have identified him with a Tertullianus whose name occurs in the index of the *Pandects*, and have supposed that he acted as an advocate; but the supposition is a mere conjecture. We know nothing of his conversion. He became a presbyter in the church, but whether he held this office in Rome or in Carthage, is matter of dispute, and there are no data to determine the question. It is certain that he visited Rome, and was well acquainted with the affairs of the Roman church. He also married; and as his wife was a Christian, it is supposed that his marriage took place after his conversion. After remaining a presbyter until he had reached middle age, he became a Montanist. Jerome attributes his adoption of Montanism to the insulting treatment which he received at the hands of the Roman clergy. But this is not likely an entirely accurate account of the matter. Jerome himself had been ill treated by the Roman clergy, and was therefore inclined to blame them; and in the character and general tendency of Tertullian's opinions, we have ample explanation of his passing over to Montanism. See **MONTANUS**. He lived to a good old age, remaining a Montanist to the last. We have no clue to precise dates in the history of Tertullian. Jerome states that he flourished under Severus and Antoninus Caracalla. Allix places his birth at 145 or 150 A.D., and his death at about 220 A.D.; but these are conjectures.

Tertullian was a man of strong and violent passions: he loved and hated with intensity. He possessed considerable culture, and was well versed in Roman law, in ancient philosophy, history, and poetry. He was not deficient in philosophical power, but he was narrow, bigoted, and uncharitable. He shows no sympathy with Greek speculation or with freedom of human thought; and he shows little sympathy with the joys and pleasures of man, being strongly inclined to asceticism. We need not wonder, therefore, that he came to believe in the paraclete of Montanus as the revealer of the perfection of Christianity, and that he adopted the Montanist opinions, that second marriages were adulteries, and that it was unlawful to flee in times of persecution, and wrong to receive the lapsed back into the communion of the church.

His writings are numerous. Attempts have been made to divide them into those which were written before he became a Montanist, and those written after that event; but the attempts have failed; for in treating many subjects he would have no occasion to say a word in regard to the paraclete, second marriages, or persecution.

His works are interesting, throwing much light on the internal circumstances of the church, on the social questions which perplexed Christians, on the opinions of heretics, and on the development of doctrine. Of his theology, Neander remarks: "In Tertullian we find the first germ of that spirit which afterward appeared with more refinement and purity in Augustine, as from Augustine the scholastic theology proceeded, and in him also the reformation found its point of connection." Among the peculiar opinions which he held may be mentioned his belief in the corporeality of the human soul.

His writings had great influence on the subsequent ages, but especially on Cyprian. Jerome says: "I saw at Concordia, in Italy, an old man named Paulus. He said that, when young, he had met at Rome with an aged amanuensis of the blessed Cyprian, who told him that Cyprian never passed a day without reading some portion of Tertullian's works; and used frequently to say: *Give me my master*, meaning Tertullian."

There are many editions of Tertullian; the best is by Franciscus Oehler (3 vols. 8vo, Lps. 1853). The third volume contains the principal dissertations on the life and writ-

ings of Tertullian. The works of Tertullian, with many dissertations and notes, form the first and second volumes of Migne's *Patrologia Latina*. The English reader will find a full and satisfactory account of Tertullian's life, writings, and opinions in bishop Kaye's *Ecclesiastical History of the Second and Third Centuries, Illustrated from the Writings of Tertullian* (8vo, 2d ed. Cambridge, 1829); and in Neander's *Anti-gnosticus or the Spirit of Tertullian*, translated by J. E. Ryland. A good translation of Tertullian's works will be found in Clark's *Anti-Nicene Christian Library*, edited by Drs. Roberts and Donaldson.

TERUEL, a province in n.e. Spain, adjoining Tarragona, Valencia, Saragossa, Castellon, Cuenca, and Guadalajara, and forming part of Aragon; drained by the Tagus, Guadalupe, Guadalaviar and smaller streams; 5,494 sq. m.; pop. '87, 241,865.

TERZA RIMA (Italian, *terza*, third, and *rima*, rhyme). A method of versification in vogue among the Italian poets, and borrowed by them from the troubadours. Three lines make a stanza, of which the first and third line rhyme, the second furnishing the exterior rhyme of the following triplet, and so on. Example :

Noi leggevamo, un giorno, per diletto
Di Laucilotto, e come amor lo strinse
Soli eravamo, e senz' alcun sospetto.

Terza rima is not common in English and French poetry.

TESCHEN, a t. of Austrian Silesia, on the right bank of the Olsa, 60 m. w.s.w. of Cracow. Pop. '90, 15,220. Here, in 1779, a treaty of peace was concluded between Maria-Theresa and Frederick II., by which the dispute of the Bavarian succession was brought to an end.

TESLA, NIKOLA, was born in Austro-Croatia in 1857. After a course in the schools of his native province, he went to Gratz to prepare for work as a professor of mathematics and physics, but becoming interested in electricity, he left Austria for Paris in 1881, and the next year, came to America. He is the inventor of various minor electrical appliances, but is principally known for his researches in the matter of alternating currents of high frequencies and very high potentials. He received the degree of LL.D. from Columbia College in 1894.

TESSERÆ, the small square tiles or cut stones used in forming tessellated pavements.

TEST ACTS, otherwise called *corporation acts*, the popular name given to two English statutes imposing certain oaths on the holders of public offices. Act 13 Car. II. c. 2, directs that all magistrates shall take the oaths of allegiance and supremacy, as well as an oath renouncing the doctrine that it is lawful to take arms against the king, and provides that they must receive the communion according to the rites of the church of England within a year before their election. Act 25 Car. II. c. 1, imposed the like conditions on the holders of all public offices, civil and military, and obliged them in addition to abjure all belief in the doctrine of transubstantiation. These acts, which were practically evaded to a large extent by means of an act of indemnity passed every year, were repealed by 9 Geo. IV. c. 17, in so far as regarded the administration of the sacrament, for which a declaration set forth in that act was substituted. A statute of William IV. substituted a declaration for an oath in most government offices. A new form of oath has been substituted for the oaths of supremacy, allegiance, and abjuration.

TESTAMENT. See BIBLE.

TESTAMENT. See WILL.

TESTER, or **TESTOON**, a flat canopy over a tomb, pulpit, etc.

TESTICLES. See REPRODUCTION.

TESTING, in chemistry, embraces a series of processes, the details of which would occupy far more space than the general plan of this work would admit of. Indeed, testing may be regarded as equivalent to qualitative analysis. As a simple illustration of the process of testing, we will assume that the most common of all chemical compounds, a salt, is submitted for examination. The student must pursue some such course as the following: 1. He must examine the dry substance before the blow-pipe, and note whether (a) it is volatile, as are the salts of ammonia and mercury; or (b) fusible, as are the salts of potash and soda; or (c) infusible, as are the salts of zinc, alumina, magnesia, lime, strontia, and baryta; or (d) reducible, as are the salts of silver, tin, lead, bismuth, antimony, and cadmium; and (e) whether it gives a coloration to the borax bead, and what that color is. 2. Having made his blow-pipe examination, he must bring his substance to a finely-divided state, and dissolve it, if possible, in water, and if it is insoluble in that fluid, even with the aid of heat, in hydrochloric or nitric acid. The solution, whether in water or acid, to which no test or reagent has been applied, is termed by Odling (*A Course of Practical Chemistry*, 2d ed. 1865) and others the *original solution*; and to this are added various tests, such as hydrogen sulphide, ammonium sulphide, ammonia, nitrate of silver, etc. The most common effect resulting from the addition of a gaseous or liquid reagent is to cause a *precipitate* or solid deposit of either the base or acid sought for. These precipitates differ in their color, consistency, etc.; and the student must note not only the color of the precipitate (although this is the most important point).

but also whether the deposit is crystalline, gelatinous, clotty, etc. 3. He must then ascertain to which group the base he is seeking for belongs. There are three great groups of bases; the members of the first group being precipitated from their acid or acidified solutions by hydrogen sulphide (hydrosulphuric acid); those of the second group not being thrown down by this reagent, but being precipitated from neutral solutions by hydrosulphate of ammonia (ammonium sulphide); while those of the third group are not thrown down by either of these reagents. The first group includes tin, arsenic, antimony, bismuth, mercury, lead, silver, copper, and cadmium; the second, nickel, cobalt, manganese, iron, chromium, aluminium, and zinc; and the third, barium, strontium, calcium, magnesium, potassium, sodium, and ammonia. (See Odling, *op. cit.* p. 64). 4. Having ascertained to which base the group belongs, the next point is to identify it. For information on this point the reader is referred to any of the standard works on qualitative analysis, or on practical chemistry. 5. The base being thus determined, it remains to determine the acid, and in searching for it the student will be much assisted by a knowledge of the solubility of the most important classes of salts. Knowing, for example, the insolubility of the sulphates of baryta and strontia, he need not search for sulphuric acid in a soluble salt of one of these earths. On the other hand, a salt insoluble in water is not likely to be a nitrate or chlorate, or acetate or chloride (the only chlorides insoluble in water being chloride of silver and calomel). We cannot enter into the testing for acids further than to observe that the nitrates and chlorates deflagrate; the tartrates and citrates char; the carbonates effervesce when acted on by an acid more energetic than carbonic acid; the silicates, borates, and benzoates are precipitated by hydrochloric acid; and the arseniates and chromates react with hydrogen sulphide. The presence of any particular acid is more or less indicated by its behavior, while still in union with the base, with strong sulphuric acid, which in many cases causes the evolution of characteristic fumes or vapors; and among the tests especially applicable for the detection of the acids (in acid solutions) are solutions of nitrate of baryta, nitrate of silver, chloride of calcium, and perchloride of iron. As the above remarks apply merely to the detection of the base and acid contained in a single salt, it will readily be understood how much the difficulties are increased when there is a mixture of several salts, or where, in place of a metallic oxide, an organic base is present, or where we have to deal with a complicated mixture of organic and inorganic substances, as, for example, in the investigation of the contents of the stomach in a case of suspected poisoning.—The following works on the subject may be referred to: Fresenius's *Qualitative Analysis*; Noad's *Qualitative Analysis*; Greville Williams's *Outlines of Chemical Manipulation*; Bowman's *Practical Chemistry*; and Odling's *Practical Chemistry*.

TEST-PAPERS are made by dipping unsized paper into an alcoholic solution of a vegetable coloring matter which changes color when exposed to the action of an acid or alkaline solution. The paper, after being gently dried, is cut into slips of a suitable size. Hence, by dipping the appropriate test-papers into any solution, we can ascertain whether it is acid, alkaline, or neutral. Litmus and turmeric are most commonly used as the coloring matters; litmus for the detection of acids, and turmeric for that of alkalis.

TEST TUBE. A thin cylindrical glass tube, with a rounded bottom and a smooth lip, extensively used in chemical experimentation, especially for testing and analyzing liquids. While comparatively inexpensive they are indispensable in the chemical laboratory. When made of the best German glass they are not liable to break in the handling and can be heated to a considerable temperature with impunity. They are manufactured of various lengths and sizes, but the most convenient size for general use is about six inches long and $\frac{1}{4}$ of an inch in diameter. Distilled water and a test tube brush are their best cleansing agents.

TESTUDO. See TORTOISE.

TESTUDO, in ancient warfare, was a defensive arrangement of the shields, by means of which a body of men advancing against a wall for assault or mining sought to protect themselves from the darts and weapons of the defenders. The men standing in close order joined their shields above their heads, the edges overlapping, until the whole resembled the shell of a tortoise (*testudo*).—The name was also applied to a machine moving on wheels, and roofed over, under which soldiers worked in undermining or otherwise destroying the walls in a siege. See BATTERING-RAM.

TET'ANUS (derived from the Gr. *teinein*, to stretch), is one of the most formidable diseases of the nervous system, and is characterized by an involuntary, persistent, intense, and painful contraction or cramp (see SPASM) of more or less extensive groups of the voluntary muscles, nearly the whole of the body being sometimes affected. There is usually a certain degree of order in which the different sets of muscles are affected. The muscles of the neck, jaws, and throat are almost always the first to give evidence of the presence of the disease. "The patient," says Dr. Watson, who has written a most graphic description of this terrible malady, "feels a difficulty and uneasiness in bending or turning his head, and supposes that he has got what is called a stiff neck. He finds also that he is unable to open his mouth with the customary facility. At length the jaws close; sometimes gradually, but with great firmness; sometimes (it is said) suddenly and with a snap. In four cases, perhaps, out of five, the disease begins in this way with

trismus or *lock-jaw*; so that this last is the vulgar name for the complaint. Along with this symptom, or very soon after it, the muscles concerned in swallowing become affected; and in a short time there comes on, what is often the most distressing part of the disorder, an acute pain at the lower part of the sternum, piercing through to the back. This pain depends, it can scarcely be doubted, upon cramp of the diaphragm, and is subject to aggravation in paroxysms. The spasm extends to the muscles of the *trunk*; to the *large* muscles of the extremities; the muscles of the *face*; and last of all, in general to the muscles of the tongue, and of the hands and fingers, which often remain movable at the will of the patient, after all the other voluntary muscles of the body have become fixed."—*Lectures on the Principles and Practice of Physics*, 4th ed., vol. i. p. 568. The muscles that are affected remain permanently contracted till either recovery or death ensues, and some of them, as, for example, the muscles of the abdomen, are so rigid, as when struck by the fingers, to resemble a board, although a perfect remission of the spasm scarcely ever occurs, except sometimes during sleep. Exacerbations of the spasms, on the other hand, commonly occur every ten minutes or quarter of an hour, usually beginning by an increase of the pain at the sternum, and lasting for two or three minutes; and as the disease advances, these paroxysms become more frequent. The powerful muscles of the back generally overcome the muscles in the front of the body, and when this excess of morbid power in the back is marked, the result is that the patient during the paroxysms rests solely on his head and heels, while his body is raised in an arched form. Occasionally the muscular contraction predominates in the opposite direction, and brings the head and knees in contact; and still more rarely, the body is bent to one side.

During the exacerbations, the face of the patient often presents a positively frightful appearance. The tongue is apt to get bitten during the contractions, which are occasionally so violent as to break the teeth, rupture powerful muscles, and at least in one case, to fracture the thigh-bone. Death usually results from a mixture of causes, but mainly from apnœa (breathlessness), due to the fixed condition of the respiratory muscles, associated with asthenia (loss of power), and flagging of the heart's action.

There are two principal causes of this disease, viz. (1) exposure to cold and damp, and (2) bodily injuries. When tetanus arises from the *first* of these causes, it is termed *idiopathic*; and when from the second, *traumatic*. Idiopathic tetanus is so rare, at all events in this country, that we may pass on at once to the consideration of the traumatic variety. The disease is liable to follow any kind of injury, from a trifling cut or scratch to a compound fracture or the most severe operation, and is much more common in tropical than in temperate climates. The following table, given by Mr. Poland in his article "Tetanus" in Holmes's *System of Surgery*, vol. i. p. 306, gives the relative proportions which the occurrence of tetanus bears to various classes of surgical lesions observed at Guy's hospital during seven years:

There were of—

| | | |
|---------------------------------|------|-----------------------------|
| Major and minor operations..... | 1364 | cases—tetanus occurred in 1 |
| Wounds of all varieties..... | 594 | " " " 9 |
| Injuries and contusions..... | 856 | " " " 1 |
| Burns and scalds..... | 458 | " " " 3 |
| Compound fractures..... | 396 | " " " 9 |
| Total..... | 3668 | 23 |

From the large experience thus afforded, it appears that tetanus is most frequently met with in the more severe varieties of injury and accident, such as compound fractures, burns, and injuries to the fingers and toes. It is still a disputed point, whether the seat of the injury forms any special connection with the disease. Hennen, one of our greatest authorities on military surgery, observed it oftener after wounds of the elbow and knee; others, again, more frequently from injuries of the thumb and great toe. There is certainly a popular belief that wounds of the ball of the thumb are especially likely to be followed by tetanus.

The interval between the reception of the injury and the first tetanic symptoms commonly varies from the 4th to the 14th day, and rarely exceeds 22 days, some time in the second week being the most common period. As a general rule, the more rapidly the disease comes on, the more fatal will be the result.

Mere *trismus* or *lock-jaw* may be induced by affections of the teeth, especially by difficult dentition of the wisdom-teeth; but this is a purely local affection, in which the muscular contraction, though persistent, is never increased by painful spasmodic paroxysms, and which usually disappears on the removal of the exciting cause; and the general knowledge of this fact may tend to remove unnecessary terrors. Hysteria sometimes mimics the phenomena of tetanus with marvelous fidelity; and hydrophobia and tetanus have been mistaken for one another, in consequence of the spasm of tetanus sometimes affecting the muscles of deglutition, and inducing a fear of swallowing. There is, however, seldom any serious difficulty in detecting the difference between tetanus and any other disease. But there is a form of poisoning which produces almost every symptom of tetanus, and which may be termed *artificial tetanus*. If strychnia or brucia, or their salts, or vegetable matter containing either or both of these alkaloids, as *nux vomica*.

St. Ignatius's beans, or the juice of the *upas tiente*, be administered, either by the stomach or by inoculation, into the system, it induces all the symptoms of intense tetanus, and there is no test by which to distinguish the results of the disease and of the poisoning, except that, according to Dr. Christison, the disease never proves so quickly fatal as the rapid cases of poisoning with strychnia. See *NUX VOMICA*.

In the way of treatment, almost every known medicine has been prescribed, and whatever plan be adopted, a vast majority of the cases terminate fatally. As is the case with certain fevers, so tetanus seems to have a definite course to run; and as Mr. Poland wisely suggests: "All we can do is to enable our patient to weather out the storm by giving him as much strength as possible, and not adding fuel to the fire by all sorts of applications and internal remedies, which have over and over again signally failed. If we can help our patient on one day after another, we gain much: constant watching and constant attention are required by night as well as by day; an unflinching perseverance on the part of the sufferer in carrying out these views; besides the avoidance of all causes of excitement, and more especially the cold air or winds; taking care to preserve a uniform temperature as much as possible." When, in consequence of the strong contraction of the muscles of the jaw, it is impossible to open the patient's mouth, food and physic should be introduced into the stomach by means of a flexible tube passed through one of the nostrils. See *TRISMUS NASCENTIUM*.

TETANUS, or LOCK-JAW, occurs in most of the domesticated animals, but most frequently in horses and sheep. It is usually produced by cold and wet, by intestinal worms, obstinate constipation, or injuries. The symptoms usually come on gradually, involve tolerably equally most of the muscular structures, which become hard and rigid; the nose is protruded, the limbs move stiffly, the tail is upraised, the bowels are constipated. The patient must be kept perfectly quiet, and in an airy but tolerably warm place, and plentifully supplied with cold water, and with soft, sloppy, but tolerably nutritive food, which he will usually greedily suck in through his firmly-closed teeth. A full dose of purgative medicine must at once be given; extract of belladonna repeated twice or thrice daily is occasionally serviceable; any discoverable wound or injury should be fomented or poulticed; bleeding, sedatives, and all causes of irritation must be avoided. In adult animals most cases are fatal; but among young animals, especially when the attack results from exposure to cold, many recoveries occur.

TÊTE À TÊTE (Fr., "head to head,") denotes conversation of an easy, confidential nature—a familiar chat. It is also the name of a small piece of furniture resembling a sofa, intended for seating two persons. The *tête-à-tête* is sometimes formed of two chair-like seats which are attached and face in opposite directions.

TETRAHEDRON (Gr. *tettares*, four, *hedra*, a side), one of the five regular geometric solids, is a solid bounded by four equilateral triangles. The best idea of it is gained by considering it as a triangular pyramid, whose three sides and base are equilateral (and therefore equal) triangles. It is a form assumed by some crystals, and in crystallography is considered as a secondary form of the octahedron (q. v.), produced by removing the alternate angles or edges of the latter.

TETRALOGY. 1. In Greek drama, three tragedies and a satyric drama presented in sequence. The satyric drama was in some cases connected with the tragedies in subject, but its main purpose was to relieve the tension caused by the trilogy. The tetralogy represents the last stage in the development of Attic tragedy.

2. A musical drama in four parts. Wagner's most famous tetralogy contains *Rheingold*, *Die Walküre*, *Siegfried*, *Götterdämmerung*. See *TRILOGY*.

TETRAPOLITAN CONFESSION, the creed of a body of Lutherans who held the doctrine of Carlstadt and of Zwingli concerning the Lord's-supper. It was drawn up by Bucer, 1531, was defended by Capito, and presented at the diet of Augsburg. The four cities which gave it a name—Constance, Strasbourg, Memmingen, and Lindau—held to it for many years.

TET RARCH (Gr. *tetrarches*, Lat. *tetrarcha*, "governor of the fourth part," i. e., of a country), a title originally designating what is signified by its etymology, the governor of one of four divisions of a kingdom or country; but, in the usage of the later Roman empire, given undistinguishingly to all minor rulers, especially in the east, possessing sovereign rights within their territory, but dependent on the emperor, and in many cases removable at his pleasure. This was especially the case in Syria, where the princes of the family of Herod are called indiscriminately by this title (Luke iii. 1) and by that of king (Matt. xiv. 9). The tetrarch in this latter sense was in truth a sovereign, although a dependent sovereign; and there are instances in which it seems to have been applied to really independent sovereigns of small principalities.

TETTER, the popular name for skin diseases of the kind described under *PSORIASIS* and *HERPES*.

TETUAN, a seaport t. and small province on the n. coast of Africa, 22 m. s. of Ceuta and 40 m. s. of Gibraltar. Pop. 25,000. It is surrounded by walls, flanked with towers, and is defended by a castle. Tetuan was taken by the Spaniards under O'Donnell (q. v.), Feb. 1860, but was evacuated next year.

TETZEL, or **TEZEL** (properly *Diez* or *Diezel*), JOHN, well known in connection with the controversy regarding indulgences, out of which the first beginnings of the reforma-

tion took their rise, was b. at Leipsic between 1450 and 1460. His father was a goldsmith of that city. Tetzel, after completing the ordinary studies of the period in the university, entered the Dominican convent of St. Paul in 1489, and soon established a reputation as a popular and effective preacher. His personal character is a subject of much controversy. The questions as to the teaching of Tetzel are more important. His ability and success as a preacher led to his being intrusted with the charge of preaching an indulgence, first on behalf of the Teutonic knights, and afterward, in 1516, on the far more momentous occasion of the celebrated indulgence published in favor of contributors to the fund for building the church of St. Peter's at Rome. In the discharge of this commission it cannot be doubted that Tetzel went to extremes which it is impossible to justify; but the worst charges, and especially that of preaching the efficacy of indulgences without repentance, and of offering anticipatory pardons for future sin, are strongly denied by Roman Catholic writers as being contradicted not only by contemporary authorities, but also by the very instructions contained in his official commission. Much of the obloquy which he drew upon his cause was produced by the pomp and apparent luxury in which he traveled about upon his mission. It was in opposition to the preaching of Tetzel that Martin Luther published his celebrated theses, on Oct. 31, 1517. Tetzel replied first by publicly burning these obnoxious propositions; but he afterward published a series of counter-theses (which were burned in retaliation by the students of the university of Wittenberg); and in May, 1518, a detailed reply to Luther's celebrated sermon on indulgences. On the arrival of the papal delegate Miltitz, Tetzel addressed to him a letter in reply to the charges of his adversaries; but, notwithstanding this defense of his conduct, he was summoned to appear before Miltitz in Leipsic in the January of the following year, and underwent a severe rebuke for the excesses in language and the improprieties in proceeding which had brought so much scandal upon the church. Miltitz threatened him, moreover, with the severest animadversions on the part of the pope. He was required in consequence to withdraw to his convent at Leipsic, where he died in the August of the same year, 1519, according to some of the plague, but according to another account, of the chagrin and mortification resulting from the judgment of the papal representative.

TEUCER, the name of two kings in ancient legend. The first, living in the Troad, whose people were called after him, Teucri, was the son, according to the mythologists, of the river-god Scamander and Ideæ. He married his daughter Batea to Dardanus of Samothrace, who was his successor, and the founder of Dardania. The second Teucer was the son of Telamon, king of Salamis, and Hesione, daughter of Laomedon. He came with the Greeks to the Trojan war, on his return from which his father would not allow him to land at Salamis because he had not avenged the death of his brother Ajax. Teucer sailed for Cyprus, where he founded another Salamis.

TEUFFEL, WILHELM, philosopher, was born at Ludwigsburg, Sept. 27, 1820; studied from 1838-42 in the theological seminary at Tübingen, where he became privat-docent in 1844; professor extraordinarius in 1849, and full professor of classical philology in 1857. His great work is his history of Roman literature (*Geschichte der römischen Litteratur*) first published in 1870 and twice re-edited by Schwabe, in 1881, and again in 1890. English translations by Wagner (1878), and by Warr (1891), have appeared. Teuffel also published *Studien und Charakteristiken zur griechischen und römischen sowie zur deutschen Litteraturgeschichte* (1871, 3d ed., 1889), and *Lateinische Stilübungen*, besides editions of the *Persæ* of Æschylus and the *Clouds* of Aristophanes. D. 1878.

TEUTOBURGER WALD (Lat. *Teutobergensis Saltus*). See HERMANN.

TEUTONIC, a term applied to a group of nations as well as of languages, forming an important division or stem of the Aryan (q. v.) family. The Teutonic languages will be found enumerated and classified in the table at the end of the article PHILLOGY. The Teutonic stock of nations, as they exist at the present day, is divided into two principal branches: (1) The Scandinavian, embracing Danes, Swedes, Norwegians, Icelanders; and (2) the Germanic, which includes, besides the German-speaking inhabitants of Germany proper (see GERMANY) and Switzerland (q. v.), also the population of the Netherlands (the Dutch), the Flemings of Belgium, and the descendants of the Anglo-Saxons in Great Britain, together with their offspring in North America, Australia, and other British colonies. It is necessary in this case, as in all similar cases, to guard against making language the sole test of race. In many parts of Germany where German now prevails, Slavic dialects were spoken down to recent times, and in some places are not yet quite extinct. And in Great Britain it is unreasonable to suppose that the Anglo-Saxon invaders exterminated the native Celtic population, or even drove more than a tithe of them into the Highlands. The mass undoubtedly remained as subject serfs, learned the language and customs of their masters, and gradually amalgamated with them.

Of the various tribes and nations spoken of as inhabiting northern Europe in ancient times, it is often difficult to determine which were really of Germanic race, and which Celtic or Slavic; the classic writers, having no skill in detecting the affinities of language, had only confused notions of ethnology. Of undoubted German nations who took part in the destruction of the Roman empire, the most prominent were the Goths (q. v.), Lombards (q. v.), Vandals (q. v.), and Franks (q. v.). The term Teutonic is derived from *Teutones*, the name of a nation or tribe first mentioned by Pytheas, who wrote about 320 B. C., as then inhabiting a part of the Cimbric Chersonesus, or Jutland. For the next 200 years there is no further mention of the Teutones, that is, not until 113 B. C., when they appear

in history as ravaging Gaul, and in conjunction with the Cimbri and Ambrones, threatening the very existence of the Roman republic. The Cimbri having gone into Spain, the Teutones and Ambrones were at length defeated by C. Marius in a great battle at Aquæ Sextiæ, or Aix, in Gaul, 102 B.C., in which from 100,000 to 200,000 of the invading army were slain, and many thousands made prisoners. A similar victory was gained by Marius in the following year over the Cimbri in the plains of Lombardy. It is disputed among ethnologists and historians whether the Cimbri so defeated were of the Celtic or of the Germanic race, and doubts have even been thrown on the claim of the Teutones to be considered Germans, although the best German scholars hold the claim to be established. Be that as it may, Roman writers, after the time of Cæsar and Tacitus, began to use the adjective *Teutonicus* as equivalent to *Germanicus*; and this practice was adopted in the middle ages by Germans writing in Latin. The native term was *theodisk*, from Goth., *thiud*, people; and it is from this word, and not from *Teutonic*, that the modern *Deutsch* is derived. See GERMANY.

TEUTONIC KNIGHTS, one of the more celebrated of the military and religious orders to which the crusades gave birth. The sufferings of the Christian soldiers at the siege of Acre excited the sympathy of certain merchants of Bremen and Lübeck, who rendered such important services by the erection of hospitals and otherwise, that duke Frederick of Swabia, with the sanction of pope Clement III. and the emperor Henry VI., enrolled them in an order of knighthood, as the Teutonic knights of St. Mary of Jerusalem. Only Germans of noble birth were made admissible to the order, the original founders having probably been ennobled before being enrolled. The members were at first all laymen, but priests were soon admitted as chaplains; and there was also added about 1221 a class of half-brothers similar to the serving-brothers of the Templars and Hospitalers. The habit of the order was a white mantle with a black cross; and the knights took vows of poverty and chastity, which in later times were not very strictly interpreted. Their first seat was Acre. On the overthrow of the kingdom of Jerusalem, the grand master removed to Venice, and from thence in 1309 to Marienburg, on the banks of the Vistula. In 1237, this order became united with the Brethren of the Sword in Livonia. In the course of the 13th c., the Teutonic knights were, with the sanction of the pope, engaged in a bloody war to enforce Christianity on the heathen nations inhabiting the southern shores of the Baltic, which resulted in the acquisition by the order of Prussia, Livonia, Courland, and other adjoining territories. Warriors from all parts of Europe in that and the following century joined their standard, including Henry IV. of England, accompanied by 300 attendant knights and men-at-arms. The conquests of the order raised it to the rank of a sovereign power, with a territory extending from the Oder to the Baltic, and embracing a population of between two and three millions, the grand master having his seat at Marienburg in Prussia. The decline of the order began in the 15th c., and its fall was brought about partly by internal dissensions, and partly by the attacks of neighboring states. Sigismund of Poland wrested w. Prussia from the knights; and Albert of Brandenburg, who was chosen grand master in hopes of his aiding the order against Poland, ended an unsuccessful war with Sigismund by an arrangement, according to which the territories of the order in e. Prussia were formed into a duchy, to be held by Albert and his successors. Mergentheim in Swabia then became the seat of the grand master, who was recognized as a spiritual prince of the empire. At the peace of Presburg in 1805, the emperor of Austria obtained the rights and revenues of the grand master; but in 1809 the order was abolished by Napoleon, its lands passing to the sovereigns in whose dominions they lay. The Teutonic order, however, still continues to preserve a titular existence in Austria.

TEWFIK I. See KHEDIVE.

TEWKESBURY, an ancient market-t. and parliamentary and municipal borough of Gloucestershire, in the vale of Evesham, on the Avon, and near its confluence with the Severn, 10 m. n.e. of Gloucester. The parish church, an ancient and noble edifice in Norman, is the most noteworthy architectural feature. Tewkesbury, which is a very ancient town, appears to be of Saxon origin. Within half a mile of it was fought (May 14, 1471) the famous battle of Tewkesbury, in which the Yorkists under Edward IV. and Richard III. inflicted a signal defeat on the Lancastrians. Pop. '91, 5269.

TEXARKANA, name of two cities with identical interests but separate governments; on the boundary line between Arkansas and Texas, and the Arkansas and Choctaw, the St. Louis, Iron Mountain, and Southern, the St. Louis, Southwestern, the Texarkana and Fort Smith, the Texarkana and Shreveport, and the Texas and Pacific railroads; the part in Arkansas being the co. seat of Miller co., and containing the post office; the part in Texas being in Bowie co., and containing a national bank. The twin city is in a rich pine lumber region, and has car shops, ice factories, cotton compress, cotton seed oil mill, machine and boiler works, and a daily and a weekly newspaper. Pop. '90, 6380 (in Arkansas, 3528; in Texas, 2852).

TEXAS, a s. western state, and the 15th admitted under the federal constitution; between lat. 25° 51' and 36° 30' n.; long. 93° 27' and 106° 43' w.; bounded on the n. by New Mexico, Oklahoma, Indian territory, and Arkansas; on the e. by Arkansas and Louisiana; on the s.e. by the Gulf of Mexico; on the s. and s.w. by Mexico, from which it is separated by the Rio Grande river; greatest length from n. to s., 825 m.; greatest breadth, 740 m.; land area, 262,290 sq. m.; gross area, 265,780 sq. m., or 170,099,200 acres. It is the largest state in the union.

HISTORY.—La Salle, the French explorer, erected a fort on Matagorda bay, in 1687. A Spanish settlement and mission was formed in 1690, but soon abandoned. In 1715 the country was settled by the Spaniards, under the name of New Philippines, and several missions established; but the Comanche and Apache Indians, among the most warlike in America, hindered the progress of the country. In 1803, when Louisiana was ceded by France to the U. S., T., claimed by both Spain and the U. S., became a disputed territory. From 1806 to 1816, settlements were formed, and several attempts made to wrest the country from Spain. In one of these, in 1813, 2500 Americans and Mexicans were killed, and 700 inhabitants of San Antonio. Mina, a Spanish refugee, gained some successes, but was defeated and shot. Lafitte, a gulf pirate, made a settlement at Galveston in 1817, but it was broken up in 1821. In 1819 the river Sabine was established as the boundary. In 1820 Moses Austin, an American, obtained a large grant of lands in T. from the Mexican government, and began a settlement, which rapidly increased; but many of the settlers were of so lawless a character that, in 1830, the government forbade any more Americans coming into T. In 1833 a convention of settlers, now 20,000 in number, made an unsuccessful attempt to form an independent Mexican state; and in 1835 a provisional government was formed, Sam Houston (q.v.) chosen commander-in-chief, and the Mexicans driven out of T. In Feb., 1836, Santa Anna, Pres. of Mexico, invaded T. with an army of 7500, invested the Alamo (q.v.), a fort near San Antonio, and on Mar. 6, put its garrison to the sword. On Mar. 2, a convention at Washington, on the Brazos, issued a declaration of independence; on Apr. 21, Santa Anna was routed by Houston, and the war was practically ended. In Sept. Houston was elected pres., and in Oct. the first congress of the new republic assembled. Its independence was acknowledged by the U. S. in 1837, and in 1840 by England, France, and Belgium. The political leaders of the "Lone Star State," as it was and is popularly called, advocated its annexation to the U. S., and this took place on Dec. 29, 1845. Mexico, which had never recognized the independence of T., invaded it, but in the war which covered the period May, 1846, to Feb., 1848, the Americans were uniformly successful. On Feb. 1, 1861, the state passed an ordinance of secession, and on Mar. 23, ratified the constitution of the Confederate States. Gov. Houston, who had neglected to take the oath of allegiance to the Confederacy, was removed from office. On Feb. 18, the U. S. troops, military posts, and munitions of war were surrendered to the state authorities by Gen. Twiggs. In 1862, Oct. 8, Galveston was occupied by a federal force, but was recaptured by the Confederates, Jan. 1, 1863. In Nov., 1863, western T. was occupied by federal troops, and here, May 13, 1865, occurred the last battle of the civil war, in which the confederates were successful. The state was under provisional and military government till Mar. 30, 1870, when an act was passed readmitting it to representation in congress. In 1876 a new constitution was adopted.

TOPOGRAPHY.—T. may be divided into four sections—the eastern, central or middle, western and northern. The first embraces the territory between the Sabine and Trinity rivers, and is the great lumber region of the state. The soil of the uplands of this portion has a light, loamy texture on a basis of red or yellow clay; in the valleys it is generally a deep vegetable mold or alluvium, very rich and productive. The second division lies between the Trinity and Colorado rivers, and contains a large portion of the wheat lands of the state, and extensive prairies. The western part includes a vast territory from the Colorado to the Rio Grande river, about four-fifths of which is prairie land and used extensively for stock-raising. The northern division contains the cos. along Red river, is about equally divided between prairie and forest, and has a yellow, loamy, sandy soil. The country on the coast is level, with a gradual ascent; the middle region undulating, with rolling prairies. The w. is a high table-land including the staked plain (*el llano estacado*) on the borders of New Mexico, a desert 2000 to 4000 ft. above the sea, without trees and almost destitute of vegetation, deriving its name from the stalks of the yucca plant which covers it. There are a few small mountains in the w.—spurs of the Rocky mts. The principal ranges, between the Pecos and the Rio Grande, are the Guadalupe, Sierra Hueca, Sierra Blanca, and Apache mts., which contain elevations of 5000 and 6000 ft. In eastern Texas, wooded lands called cross-timbers, alternate with prairies, and the country has a park-like appearance. The Texas coast line is about 400 m. long, and is bordered by a chain of sandy islands, bars, etc., divided from the main land by bays and lagoons. The largest of these bays, Galveston, extends inland 35 m. Matagorda bay is 60 m. long, and from 6 to 10 m. wide, but is rapidly filling up. San Luis Inlet and Aransas, Corpus Christi, and Espiritu Santo bays are from 20 to 25 m. in length, but obstructed by sandbars. The Rio Grande, forming the boundary line between T. and Mexico, is navigable for 400 or 500 m. The Red river, forming the greater part of the northern boundary, is navigable for nearly its entire course. The Sabine forms part of the boundary with Louisiana, but rises in Texas, as do the Nueces, Guadalupe, Colorado, Brazos, Trinity, all of which empty into the Gulf of Mexico. The only river of size emptying into the Rio Grande is the Pecos, which rises in New Mexico and crosses the western part of Texas. Though the country is level, as a rule, it is not destitute of grand scenery.

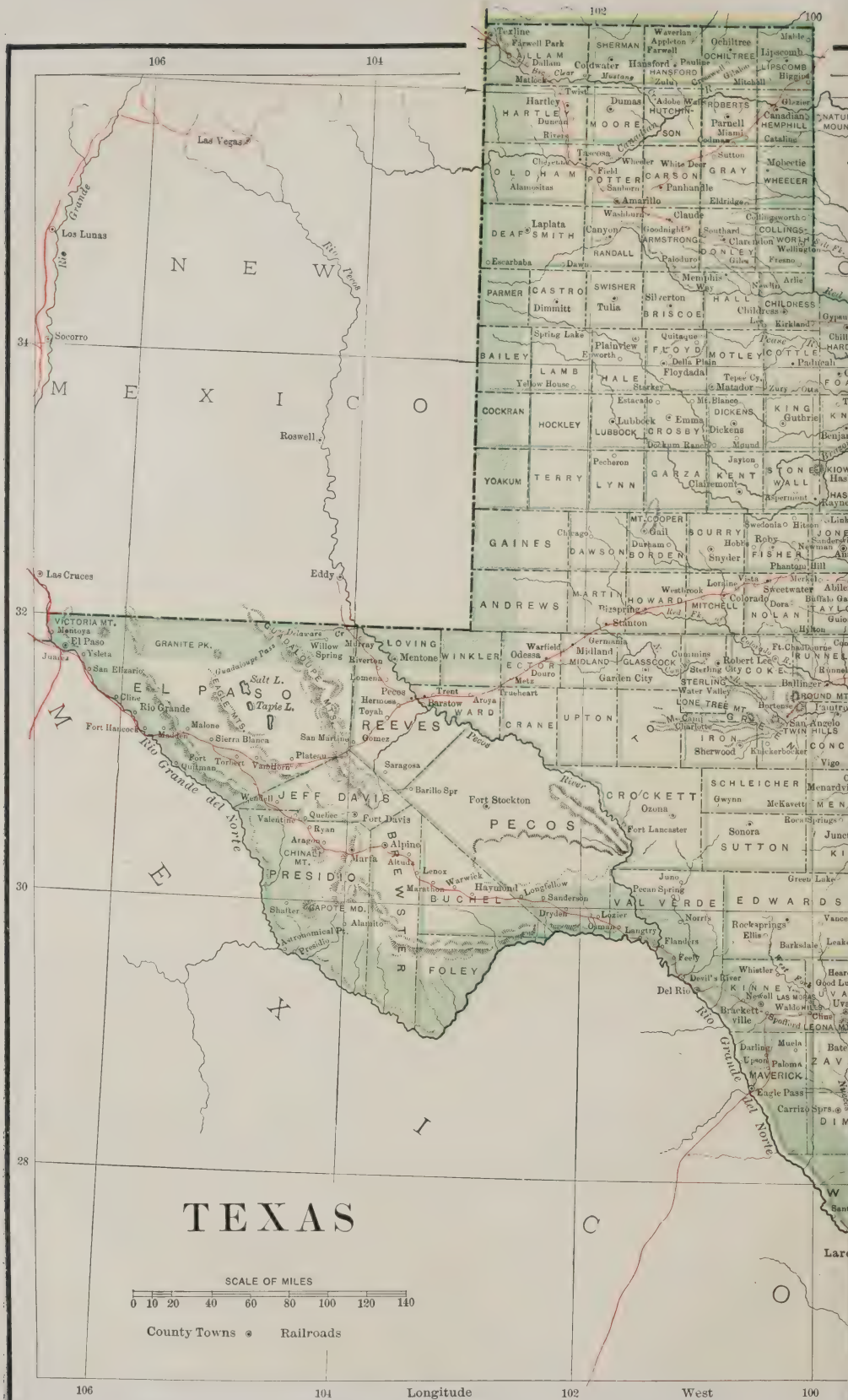
GEOLOGY AND MINERALOGY.—The principal geological formations are the alluvial, tertiary, cretaceous, and carboniferous. The alluvial extends along the gulf coast; back of this is the tertiary, having its widest expansion in the east; next, in the n.w., is the cre-

AREA AND POPULATION OF TEXAS BY COUNTIES.

(ELEVENTH CENSUS : 1890.)

| | Area in Square Miles. | Population. | | Area in Square Miles. | Population. |
|---------------------|-----------------------------|-------------|------------------|-----------------------------|-------------|
| Anderson | 1,000 | 20,923 | Delta | 260 | 9,117 |
| Andrews | 1,500 | 24 | Denton | 900 | 21,289 |
| Angelina | 880 | 6,806 | De Witt | 880 | 14,307 |
| Aransas | 400 | 1,824 | Dickens | 840 | 295 |
| Archer | 900 | 2,101 | Dimmit | 1,100 | 1,049 |
| Armstrong | 900 | 944 | Donley | 900 | 1,056 |
| Atascosa | 1,200 | 6,459 | Duval | 1,750 | 7,598 |
| Austin | 700 | 17,859 | Eastland | 900 | 10,373 |
| *Bailey | 900 | ..... | Ector | 900 | 224 |
| Bandera | 970 | 3,795 | Edwards | 2,620 | 1,970 |
| Bastrop | 960 | 20,736 | Ellis | 950 | 31,774 |
| Baylor | 900 | 2,595 | El Paso | 9,750 | 15,678 |
| Bee | 980 | 3,720 | Encinal | 1,700 | 2,744 |
| Bell | 1,000 | 33,377 | Erath | 1,000 | 21,594 |
| Bexar | 1,180 | 49,266 | Falls | 770 | 20,706 |
| Blanco | 710 | 4,649 | Fannin | 1,000 | 38,709 |
| Borden | 920 | 222 | Fayette | 960 | 31,481 |
| Bosque | 980 | 14,224 | Fisher | 900 | 2,996 |
| Bowie | 920 | 20,267 | Floyd | 1,100 | 529 |
| Brazoria | 1,440 | 11,506 | Foley | 2,100 | 25 |
| Brazos | 510 | 16,650 | Fort Bend | 880 | 10,586 |
| Brewster | 2,640 | 710 | Franklin | 300 | 6,481 |
| *Briscoe | 900 | ..... | Freestone | 870 | 15,987 |
| Brown | 900 | 11,421 | Frio | 1,010 | 3,112 |
| Buchel | 1,440 | 298 | Gaines | 1,500 | 68 |
| Burleson | 640 | 13,001 | Galveston | 640 | 31,476 |
| Burnet | 1,000 | 10,747 | Garza | 900 | 14 |
| Caldwell | 500 | 15,769 | Gillespie | 960 | 7,056 |
| Calhoun | 500 | 815 | Glasscock | 900 | 208 |
| Callahan | 900 | 5,457 | Goliad | 820 | 5,910 |
| Cameron | 1,960 | 14,424 | Gonzales | 980 | 18,016 |
| Camp | 200 | 6,624 | Gray | 900 | 203 |
| Carson | 900 | 356 | Grayson | 960 | 53,211 |
| Cass | 950 | 22,554 | Gregg | 260 | 9,402 |
| Castro | 840 | 9 | Grimes | 720 | 21,312 |
| Chambers | 840 | 2,241 | Guadalupe | 710 | 15,217 |
| Cherokee | 1,000 | 22,975 | Hale | 1,100 | 721 |
| Childress | 750 | 1,175 | Hall | 900 | 703 |
| Clay | 1,100 | 7,503 | Hamilton | 900 | 9,313 |
| *Cochran | 840 | ..... | Hansford | 910 | 133 |
| Coke | 900 | 2,059 | Hardeman | 1,180 | 3,904 |
| Coleman | 1,290 | 6,112 | Hardin | 940 | 3,956 |
| Collin | 880 | 36,736 | Harris | 1,800 | 37,249 |
| Collingsworth | 900 | 357 | Harrison | 880 | 26,721 |
| Colorado | 900 | 19,512 | Hartley | 1,480 | 252 |
| Comal | 580 | 6,398 | Haskell | 900 | 1,665 |
| Comanche | 960 | 15,608 | Hays | 680 | 11,352 |
| Concho | 1,010 | 1,065 | Hemphill | 900 | 519 |
| Cooke | 920 | 24,696 | Henderson | 960 | 12,285 |
| Coryell | 1,000 | 16,873 | Hidalgo | 2,970 | 6,534 |
| Cottle | 1,060 | 240 | Hill | 1,000 | 27,583 |
| Crane | 1,000 | 15 | *Hockley | 940 | ..... |
| Crochett | 3,510 | 194 | Hood | 460 | 7,614 |
| Crosby | 900 | 346 | Hopkins | 750 | 20,572 |
| Dallam | 1,400 | 112 | Houston | 1,200 | 19,360 |
| Dallas | 900 | 67,042 | Howard | 840 | 1,210 |
| Dawson | 900 | 29 | Hunt | 870 | 31,885 |
| Deaf Smith | 1,380 | 179 | Hutchinson | 900 | 58 |

* No Population.



TEXAS

SCALE OF MILES
0 10 20 40 60 80 100 120 140

County Towns • Railroads



STRUTHERS & CO., ENGRS., N. Y.

AREA AND POPULATION OF TEXAS BY COUNTIES.—CONTINUED.

| | Area in Square Miles. | Population. | | Area in Square Miles. | Population. |
|-------------------|-----------------------------|-------------|---------------------|-----------------------------|-------------|
| Irion | 970 | 870 | Polk | 1,200 | 10,332 |
| Jack | 1,000 | 9,740 | Potter | 900 | 849 |
| Jackson | 880 | 3,281 | Presidio | 3,470 | 1,698 |
| Jasper | 840 | 5,592 | Rains | 270 | 3,909 |
| Jeff Davis | 2,390 | 1,394 | Randall | 900 | 187 |
| Jefferson | 960 | 5,857 | Red River | 1,060 | 21,452 |
| Johnson | 720 | 22,313 | Reeves | 2,390 | 1,247 |
| Jones | 900 | 3,797 | Refugio | 760 | 1,239 |
| Karnes | 730 | 3,637 | Roberts | 900 | 326 |
| Kaufman | 800 | 21,598 | Robertson | 850 | 26,506 |
| Kendall | 620 | 3,826 | Rockwall | 150 | 5,972 |
| Kent | 840 | 324 | Runnels | 910 | 5,193 |
| Kerr | 1,100 | 4,462 | Rusk | 939 | 18,559 |
| Kimble | 1,360 | 2,243 | Sabine | 580 | 4,969 |
| King | 900 | 173 | San Augustine | 560 | 6,688 |
| Kinney | 1,700 | 3,781 | San Jacinto | 640 | 7,360 |
| Knox | 900 | 1,134 | San Patricio | 630 | 1,312 |
| Lamar | 900 | 37,302 | San Saba | 1,180 | 6,641 |
| Lamb | 1,010 | 4 | Schleicher | 1,500 | 155 |
| Lampasas | 800 | 7,584 | Scurry | 900 | 1,415 |
| La Salle | 1,460 | 2,139 | Shackelford | 900 | 2,012 |
| Lavaca | 1,000 | 21,887 | Shelby | 800 | 14,365 |
| Lee | 640 | 11,952 | Sherman | 900 | 34 |
| Leon | 1,000 | 1,841 | Smith | 930 | 28,324 |
| Liberty | 1,170 | 4,230 | Somervell | 200 | 3,419 |
| Limestone | 960 | 21,678 | Starr | 2,570 | 10,749 |
| Lipscomb | 900 | 632 | Stephens | 900 | 4,926 |
| Live Oak | 1,100 | 2,055 | Stonewall | 900 | 1,024 |
| Llano | 900 | 6,772 | Sutton | 1,620 | 658 |
| Loving | 900 | 3 | Swisher | 900 | 100 |
| Lubbock | 900 | 33 | Tarrant | 900 | 41,142 |
| Lynn | 900 | 24 | Taylor | 900 | 6,957 |
| McCulloch | 1,000 | 3,217 | Terry | 900 | 21 |
| McLennan | 1,040 | 39,204 | Throckmorton | 500 | 902 |
| McMullen | 1,200 | 1,038 | Titus | 400 | 8,190 |
| Madison | 450 | 8,512 | Tom Green | 2,940 | 5,152 |
| Marion | 420 | 10,862 | Travis | 1,040 | 36,322 |
| Martin | 900 | 264 | Trinity | 710 | 7,648 |
| Mason | 960 | 5,180 | Tyler | 930 | 10,877 |
| Matagorda | 1,150 | 3,985 | Upshur | 520 | 12,695 |
| Maverick | 1,320 | 3,682 | Upton | 1,140 | 52 |
| Medina | 1,270 | 5,730 | Uvalde | 1,420 | 3,804 |
| Menard | 880 | 1,215 | Val Verde | 2,880 | 2,874 |
| Midland | 900 | 1,033 | Van Zandt | 840 | 16,225 |
| Milam | 1,000 | 24,773 | Victoria | 850 | 8,737 |
| Mills | 640 | 5,493 | Walker | 740 | 12,874 |
| Mitchell | 900 | 2,059 | Waller | 500 | 10,888 |
| Montague | 890 | 18,863 | Ward | 1,160 | 77 |
| Montgomery | 1,100 | 11,765 | Washington | 600 | 29,161 |
| Moore | 900 | 15 | Webb | 1,680 | 14,842 |
| Morris | 260 | 6,580 | Wharton | 1,100 | 7,584 |
| Motley | 1,080 | 139 | Wheeler | 900 | 778 |
| Nacogdoches | 960 | 15,984 | Wichita | 600 | 4,831 |
| Navarro | 1,020 | 26,373 | Wilbarger | 940 | 7,092 |
| Newton | 970 | 4,650 | Williamson | 1,070 | 25,909 |
| Nolan | 900 | 1,573 | Wilson | 940 | 10,655 |
| Nueces | 2,430 | 8,093 | Winkler | 800 | 18 |
| Ochiltree | 900 | 198 | Wise | 900 | 24,134 |
| Oldham | 1,460 | 270 | Wood | 700 | 13,932 |
| Orange | 390 | 4,770 | Yoakum | 840 | 4 |
| Palo Pinto | 960 | 8,320 | Young | 900 | 5,049 |
| Panola | 800 | 14,328 | Zapata | 1,370 | 3,562 |
| Parker | 900 | 21,682 | Zavalla | 1,200 | 1,097 |
| Parmer | 850 | 7 | | | |
| Pecos | 6,700 | 1,326 | Total | 262,290 | 2,235,523 |

taceous, extending w. on Red river and s. to San Antonio. The carboniferous formation extends through the cos. w. of Cooke co. to the "staked plain," stretching s. from Red river to and beyond the upper Colorado. Copper is the most abundant metallic product, and a belt of the ore extends from the Red river and the cos. of Clay, Archer, etc., across to the Rio Grande, through Pecos and Presidio cos. Iron, lead, silver, and bismuth are also known to exist in the interior of the state. The large coal-field, mentioned above, is an outlying spur of the great Missouri coal-field, and yields a bituminous coal having 52 per cent. of fixed carbon. A smaller coal-field in Brown, Coleman, Comanche, and Hamilton cos. is anthracite or semi-anthracite of good quality. In the n.w. salt springs and salt lakes are numerous, and along the gulf shore, especially s. westward, there are extensive and productive salt lagoons. Potters' and fire-clays, marble, roofing-slate, grindstones, soapstones, feldspar, alum, antimony, arsenic, mineral oils and pigments, marls and other fertilizers, are found in great quantities here and there. At fort Worth, Gatesville, and elsewhere petroleum is obtained at depths of from 240 to 560 ft. Sulphur and chalybeate springs are numerous. Gigantic animal fossils and silicified trees are found in some localities.

ZOOLOGY.—Among wild animals are the bear, panther, jaguar, black wolf, Texas wolf, wild cat, antelope, deer, peccary, opossum, jack rabbit, marsh hare, prairie dog, and armadillo; among birds and wild-fowl, the Mexican eagle, raven, frigate, wild turkey, road runner, blackbird, whippoorwill, oriole, hairy woodpecker, logcock, swallow-tailed fly-catcher, cañon wren, ruby-throated and broad-tailed hummingbird, spoonbill, white heron, flamingo, crane, cormorant, and grebe. Scorpions, centipedes, lizards, and horned frogs are common, and the agricultural ant greatly interests entomologists. Shell-fish, turtles, and fish of fine flavor abound in the bays and inlets.

BOTANY.—The principal trees are the oak, elm, long and short-leaved pine, yellow pine, ash, buttonwood, mulberry, cypress, juniper, cedar, magnolia, live-oak, pecan, maple, hickory, walnut, gum, palmetto, willow, osage orange, mesquite and China tree. Cacti, many of which bear edible fruit, are abundant. The passion flower is indigenous, and there are 7 species of native grapes. Strawberries, blackberries, and dewberries are found everywhere. The prairies are covered with sweet-scented and brilliant flowers: the phlox, verbenas, crocus, lupine, etc.

CLIMATE.—This is pure, temperate, and remarkably salubrious. The summer heat is relieved by breezes from the gulf, and the winters are mild but invigorating. The climate of the gulf coast is semi-tropical. The eastern part is rainy; the middle, moderate; the s. western portion, dry. Cotton picking begins about July 1. Corn is planted in Feb. and harvesting is done in July. The mean annual temperature for the state is 69.29°. At Austin the av. summer temperature is 81.68°; in winter it is 51.16°; at San Antonio, the corresponding averages are 83.73° and 69.29°. The mean annual rainfall is about 48 ins.

SOIL AND AGRICULTURE.—The soil, of which there are 3 or 4 varieties, is in general very fertile. The stiff black soil of the river bottoms is fittest for sugar and cotton, though the latter grows well on the prairies and uplands; the finer black or chocolate-colored soil of the prairie lands yields abundant crops of corn and the cereals, and the lighter copper-colored soil of the uplands is well adapted for the grasses and fruits, while the fine silt of the islands produces the best sea-island cotton known. The soil of the desert tracts of the n.w. is sandy and charged with carbonate of soda and other alkalis, which when irrigated produces moderate quantities of grasses and herbage. In many places irrigation by means of canals or artesian wells is necessary, and market gardens cultivated by this method produce every kind of vegetable. In the northern parts of the state wheat, barley, oats, corn, and cotton are the staple products, while sweet and Irish potatoes and other vegetables common in temperate climates are raised to considerable extent. Apples, pears, peaches, plums, grapes, and strawberries are also cultivated. Along the gulf the orange, lemon, olive, fig, and other semi-tropical fruits thrive. Sugar-cane is raised in this region in profitable quantities, and also rice. Tobacco is cultivated to some extent both at the north and south. Pasturage is abundant, and more than one-third of the land of the state is devoted to cattle and sheep raising. The principal productions are corn, oats, wheat, potatoes, hay, sugar, molasses, sorghum syrup, vegetables, and fruit. The cotton crop averages from about 2,500,000 to 3,275,000 bales.

MANUFACTURES, ETC.—The abundance of raw material, the water-power of the w. central region, and the high price of manufactured goods have stimulated these industries a great deal, and manufacturing since 1870 has made much progress. The packing of meats, the manufacture of condensed-meat essences, meat biscuits, etc., and the shipment of hides are yearly increasing. The U. S. census for 1890 reported for Texas 5268 manufacturing establishments, employing \$46,815,181 capital and 39,475 persons, paying \$18,586,338 for wages and \$36,152,308 for materials, and having a combined output valued at \$70,433,551. The principal manufactures are lumber products, flour and grist mill products, cotton seed oil and cake, foundry and machine-shop products, malt liquors, brick and tile, clothing, and artificial ice. The various clay industries have an annual output exceeding \$1,000,000 in value; and the coal product is about 500,000 short tons per annum.

COMMERCE.—Among the articles of export are cotton, sugar, molasses, cattle, hides, packed meats, wool, and lumber. A large part of the state's trade is with Mexico. The ports of entry are Galveston, Paso del Norte, Corpus Christi, Brazos de Santiago, and Saluria. Important centers of trade are Galveston, the great Texan seaport, Dallas, Houston, and Waco. San Antonio is the greatest market in the United States for horses and mules. Brownsville, on the Rio Grande, has a large river trade. Corsicana deals in cotton, wool, and hides. Fort Worth is a great corn-mart. Texarkana, situated partly in Arkansas, is a busy railroad center. El Paso receives great shipments of silver. Austin, the capital, manufactures ironware, leather-goods, flour, ice, and dressed lumber. The foreign commerce of Texas has been greatly stimulated by the improvements in the harbor of Galveston (q. v.). In the fiscal year 1896-7 the imports of merchandise at all ports had a value of over \$4,000,000; exports, over \$71,000,000; imports of gold and silver coin and bullion, \$7,485,000; exports, \$108,000.

RAILROADS.—The total length of railroads exceeds 9250 miles. The combined capital stock of operating companies is over \$130,000,000; funded debt, \$175,500,000; total investment, \$311,000,000; cost of roads and equipments, \$302,500,000; net earnings, \$5,700,000. The principal roads are the Texas and Pacific, the Southern Pacific, the International and Great Northern, and the Missouri, Kansas, and Texas.

BANKS.—On Oct. 31, 1896, there were 206 national banks in operation, with a capital of \$21,570,000; outstanding circulation, \$4,981,459; deposits, \$30,614,621; and reserve, \$12,166,279; 8 state banks, with capital, \$885,150; deposits, \$1,034,021; and resources, \$2,219,132; and 25 private banks, with capital, \$3,090,434; deposits, \$3,270,571; and resources, \$7,269,011. The exchanges of the year at the clearing-houses at Galveston, Houston, Dallas, Fort Worth, and Waco, aggregated over \$390,000,000.

RELIGIOUS DENOMINATIONS, EDUCATION, ETC.—The leading denominations numerically are the Methodist Episcopal, Baptist, Presbyterian, Christian, Protestant Episcopal, Roman Catholic, Lutheran.

The public schools of the state are under the control of a board of education, composed of the governor, comptroller, and secretary of state. The public school system has a liberal endowment, consisting of over \$7,000,000 in interest-bearing bonds, over \$14,000,000 in interest-bearing land notes, and about 23,000,000 acres of land, nearly all of which is leased. In addition to this state endowment, each co. has an independent endowment of four leagues of land. The total state and co. permanent fund exceeds \$73,000,000. The public school population is over 900,000; enrollment over 600,000; average daily attendance, about 500,000; schoolhouses, over 10,000; value of public school property, over \$7,000,000; annual expenditure, nearly \$4,000,000. The higher institutions include the university of Texas, at Austin; Fort Worth university, Fort Worth; Southwestern university, Georgetown; Wiley university, Marshall; Trinity university, Tehuacana; Baylor university, Waco; Add-Rau Christian university; Thorp Spring; State agricultural and mechanical college, College Station; Sam Houston normal institute, Huntsville; State normal school, Prairie View; Blinn memorial college, Brenham; Mary Allen seminary, Crockett; Baylor female college, Belton; and female colleges at Chapel Hill and Waco. Among the charitable institutions are state insane asylums at Austin, San Antonio, and Terrell; state orphan asylum, Corsicana; state house of correction and reformatory, Gatesville; state asylums for the blind and the deaf and dumb, and institute for deaf, dumb, and blind colored youth, all at or near Austin; and the confederate soldiers' home. There are about 40 libraries in the state, of 1,000 volumes and upward each, with a total of nearly 150,000 volumes, and (1897) 746 periodicals of all kinds.

GOVERNMENT, ETC.—The capital is Austin. The term of the governor and all of the executive officers is two years. The governor's salary is \$4000. The legislature meets biennially, and consists of a senate of thirty-one members, elected for four years, and a house of representatives of 128 members, elected for two years. Each receives \$5 a day. Sessions are biennial, and limited to 90 days. Judicial officers are elected, and serve for limited terms. Voters must have resided one year in the state and six months in the district where the vote is cast; and if financial measures are voted upon, taxpayers alone are allowed to vote. State elections take place on the Tuesday after the first Monday in November. The supreme court consists of three judges elected by the people, and receiving \$3500 salary each. The penitentiaries are at Huntsville and Rusk. The new State Capitol at Austin, for whose erection 3,000,000 acres of public land were granted as an appropriation by the legislature, is one of the most magnificent legislative buildings in the world. It is built of red Texas granite, and is surmounted by a dome 311 feet in height. It was finished in 1888, and the cost was not far from \$3,500,000.

The electoral votes have been cast as follows: 1848, Cass and Butler, 4; 1852, Pierce and King, 4; 1856, Buchanan and Breckenridge, 4; 1860, Breckenridge and Lane, 4; 1864 and 1868 no vote was cast; 1872, Greeley and Brown, 8; 1876, Tilden and Hendricks, 8; 1880, Hancock and English, 8; 1884, Cleveland and Hendricks, 13; 1888, Cleveland and Thurman, 13; 1892, Cleveland and Stevenson, 15; 1896, Bryan and Sewall, 15.

The state militia consists of 3000 officers and men; unorganized but available for military duty, 300,000.

FINANCES.—The assessed valuations in 1896 were: real estate \$587,560.471, personal property \$262,748.775—total, \$850,309.246; tax rate, \$3.80 per \$1000. In 1897 the total bonded debt was \$3,992,030, of which various state funds held \$3,244,540, leaving \$747,490 in the hands of individuals.

POPULATION.—In 1806, 7000; 1850, 212,592—58,161 slave, 397 free col'd; 1860, 604,215—182,566 slave, 355 free col'd; 1870, 818,579—253,475 col'd; 1880, 1,591,749—394,512 col'd, including 136 Chinese, 992 civilized or taxed Indians; male, 837,840; female, 753,909; dwellings, 287,562; families, 297,259; persons to sq. m., 6.1; engaged in agriculture, 359,317; in trades and transportation, 34,909; foreign born, 114,616. Rank of state, 11th in pop. Population, 1890, 2,235,523. There are 246 organized cos.; for pop. 1890, see Census Tables, Vol. XV. The largest cities, 1890, were: Dallas, 38,067; San Antonio, 37,673; Galveston, 29,084; Houston, 27,557; Fort Worth, 23,076; Austin, 14,476, and Waco, 14,445.

See Thrall's *History of Texas*; Spaight's *Resources of Texas* (Austin, 1882).

TEXAS, a co. in s. Missouri, drained by Current river, and the branches of the Gasconade river; about 1145 sq. m.; pop. '90, 19,406, chiefly of American birth. The surface is hilly and heavily wooded. The soil in the river valleys is rich. The principal productions are corn, wheat, tobacco, oats, wool, and cattle. Co. seat, Houston.

TEXAS, a tp. in Wayne co., Penn. Pop. '90, 4409.

TEXAS CATTLE DISEASE, otherwise called Spanish fever, splenic fever, acclimation fever, American cattle plague, red water, black water, yellow murrain, and bloody murrain; a very fatal epizootic, contagious or infectious fever of cattle, confined to regions s. of the 37th parallel of n. latitude, except when communicated by cattle brought from there. It appeared in South Carolina as early as 1814, and subsequently Virginia and North Carolina passed stringent laws against the introduction of cattle from South Carolina and Georgia. The greatest losses have been caused by driving Texas cattle through Arkansas, Missouri, and Kansas, and distributing them to feeders in various western states. Missouri, in 1852–53, Kansas and Iowa, in 1856 and 1857, and parts of Illinois and Indiana, in 1868, suffered severely.

All observations indicate that in the permanently infected districts s. of parallel 37° the cattle become accustomed to the influence of the disease germs, and that the effect is much milder upon the organization, passing through it without creating much disturbance, and generally without being noticed. When, however, the southern cattle are taken into regions previously unaffected the native cattle, not being protected by previous habitual exposure, become the victims of the disease. The imported droves, also, when crowded, suffer to a certain extent, but not in comparison with the native cattle. Native cattle have been known to convey the disease to native cattle in other states, one instance being where native cows from Painesville, Ohio, brought the disease to Orange co., N. Y., causing the death of eight animals. *Symptoms.*—One of the first symptoms is an elevation of the animal temperature, which ranges usually from 106° to 108° Fahr. but occasionally not more than 104° to 105°, and sometimes as high as 110°. As death approaches the temperature falls to below the normal. The first outward symptoms are those of languor and fatigue, as drooping of the head, lopped ears, and arching of the back. The eyes are staring, the coat rough, the horns are hot and the nose dry. As the disease advances the head droops more, so that the nose almost reaches the ground; the hind legs are placed far under the body; the legs are very weak and the animal has a disposition to lie down, especially in water. The pulse is very frequent; sometimes soft and feeble, but often hard and wiry. The post mortem appearances are only to be seen soon after death, as decomposition rapidly sets in and speedily obliterates the pathological conditions. When soon enough examined the muscles have a dark red color, and the fat is of a deep brownish yellow, in some cases having a bronzed appearance. All the tissues, but particularly the muscles, have a peculiar sickening odor. On examining the alimentary canal the œsophagus and the first three stomachs have generally a not unnatural appearance, although the third stomach is often found dry and obstructed. In the fourth stomach there are characteristic changes. The whole mucous membrane is more or less congested, the cardiac portion especially, but the more peculiar lesions are at the pyloric end. It is not so much discolored, but is full of erosions, sloughs, and deep, excavated ulcers. The small intestines are the seat of congestions. Engorgements and extravasations of blood are common in the large intestines. The liver is usually enlarged, sometimes weighing from twenty to twenty-seven pounds, and fatty or waxy. The bile-ducts are injected with a yellowish-brown bile, and the gall bladder is almost always distended, with a dark, thick, flaky, and tarry looking bile, sometimes amounting to as much as four pounds. The kidneys are usually congested and enlarged, and the cortical substance softened. In a few cases they have a healthy appearance. The urinary bladder is generally distended with dark bloody urine, and the mucous membrane is frequently thickened and inflamed. The spleen is always enlarged, and engorged with dark colored blood. It is frequently softened, and in some cases is a mere pulpy, disorganized mass. It has been found two feet and a half long, and having a weight of over nine pounds. The lungs are generally healthy in appearance with the exception of small points of extravasation, and enlargement of some of the air-

cells The blood in the blood-vessels is nearly natural in appearance and coagulates quickly, but is generally rather more watery than in health. Dr. J. Cresson Stiles found that the white corpuscles were in excess only in one case, but the liquor sanguinis was yellower than in health, and contained minute flocculi of yellow granular matter. In some instances complete dissolution of the blood globules took place long before putrefaction. There is considerable difference of opinion as to the cause of the disease and the nature of the infectious principle, but the general opinion is that it is owing to the development of a disease germ. The period of incubation varies. All observers agree that it is always as much as ten days, but it is often from two to six weeks, and even longer. The chief measures against the disease are those of prevention.

TEXAS, UNIVERSITY OF; a co-educational institution of learning, with its academic and law departments (opened 1883) at Austin, its medical department (opened 1891) at Galveston, and its agricultural and mechanical departments (in existence before the university, and joined to it in 1876) at Bryan. In 1895 the students numbered over 900, of whom 406 belonged to the academic and law departments, and 180 to the medical college.

TEXEL, THE, an island in the province of n. Holland, separated from the Helder by a narrow strait, called the Marsdiep, contains about 35,000 acres of arable and pasture lands, and has a pop. of '89, 5878. Many sheep are kept, producing fine wool. Fishing, shipbuilding, grinding corn, etc., are also sources of prosperity. There is much wealth in the island, but recently no steamboat communication existed with the mainland. The northern part is called Eijerland, or the egg-country, immense flocks of birds coming thither from Scandinavia to deposit their eggs. The capital is Den Burg.

TEXTILE FABRICS. See WEAVING.

TEXTUAL CRITICISM is the criticism based upon the careful study and comparison of the existing texts of literary works with a view to the detection of errors that have crept in, and the restoration of the true reading, as intended by the author. Textual criticism finds its richest field in the remains of the Greek and Roman authors that have come down to us, in the study of the New Testament, and in the discussion of the meaning of some few great modern authors, such as Chaucer and Shakespeare.

In the first two cases, the criticism of the texts of the classical authors and of the New Testament, the results depend upon the minute investigation of the manuscripts or *codices*. A *codex* is, in general, a parchment book of folio or quarto size, written on both sides of each leaf, and with marginal notes usually later than the writing on the body of the page. Most of the Greek and Latin codices date from the XIII., XIV., and XV. centuries, though some are two or three hundred years earlier. The oldest are written in capital or uncial letters, the later in minuscules. The former have no punctuation or division, the latter have both. It is probable that all books were originally written in capitals, and that all the existing codices are traceable ultimately to these. The original book is technically known as the "Archetype."

No existing codex is free from error. Being copied by scribes who did their work mechanically and often ignorantly, there are in every manuscript sentences that, as they stand, have no meaning, and words that are not real words at all. These, in the case of a given manuscript, can often be corrected by reference to another manuscript which does not contain the identical blunders; but it occasionally happens that all the manuscripts have the same error. Again, it is not uncommon to find several manuscripts all giving intelligible readings—sentences that have a good meaning—and yet all differing from one another. Textual criticism, then, endeavors in the first instance to make intelligible that which is on the face of it unintelligible; and in the second instance, to discover which one of several intelligible readings is the one intended by the author; or else if this is not susceptible of demonstration, to offer a reasonable conjecture as to the original form of the sentence.

Errors in MSS. are of three kinds: (1) Accidental; (2) Unavoidable; (3) Fraudulent.

I. ACCIDENTAL ERRORS.—These are naturally the most numerous, and come from the ignorance, carelessness, or misunderstanding of the writer. These may be classified as follows:

(a) *Errors due to dictation.*—These are due to the imperfect enunciation of the words by the reader, or to the imperfect hearing of the scribe. Instances are found in the Vatican MS. of the New Testament in Acts xxvii. 30, ἐξώσαι for ἐκώσαι, the sound of the words being the same; and in 1 Thess. i. 3, ἀδεαλίπτορ for ἀδιαλείπτορ.

(b) *Confusion of Letters.*—This is common in the Greek capital letters, Α, Δ, Δ; Θ and Ο; Π and Τ; and in the Latin capitals, C and G, E and F.

(c) *Confusion of Words.*—Words like the Greek φόνον and φόβον and the Latin *voluntas* and *voluptas* are often confused, especially when either gives an intelligible reading.

(d) *Transposition of Words or Letters.*—An interesting instance is that in Virgil's Georgics (II. 356), when *sub vomere et ipsa* is in some MSS. converted into *submoveret ipsa*.

(e) *Incorrect Division of Words.*—This error easily arose when the MSS. had no punctuation and no separation of letters.

(f) *Letters or Syllables Omitted.*—This is technically known as *lipography*. An instance is thus found in Horace's Satires (II., iv., 11), where some MSS. read *celebitur* for *celebrabitur*. When a syllable or letter ought to be written double and is only once written, the name *haplography* is given to the error.

(g) *Ditto*graphy is the opposite of the preceding error, and consists in accidentally writing a letter, syllable, or word twice.

(h) *Loss of Plan*, which often leads to the omission of whole lines and is a particular instance of lipography.

(i) *Interpolation*.—This error often arises from the incorporation, by the scribe, in the text of an explanatory word or sentence written on the margin.

II. UNAVOIDABLE.—When the book set before the scribe was imperfect, mutilated, or in any way damaged, his copy of it would naturally be similarly corrupt. Thus the existing codices of Suetonius all contain a lacuna or gap at the beginning of the First Book, thus showing the Archetype to have been imperfect. Sometimes, again, a scribe who had accidentally omitted a line or several lines, would, on discovering his error write them at the bottom of the page. A subsequent copyist of his copy would suppose this to be the proper order, and thus perpetuate what was originally a mistake.

III. FRAUDULENT ERRORS.—These are due either (1) to a desire to modify an author's statements for some particular motive; or (2) a desire to improve upon the original. Of the first sort is said to be the mention of Athens in Homer's *Iliad* (II., 553-555 and 558), interpolated in the original in order to make Athens seem to have been a place of importance in the days of Homer. There are a number of such fraudulent "corrections" in the MSS. of the New Testament, intended to do away with some minor verbal contradictions in the different Gospel narratives. Numerous attempts at syntactical corrections occur in the MSS. of the Greek and Latin classics.

The old printed texts of many of the early English writers are often as full of errors as the written codices of mediæval times, for the first printers in England were generally foreigners. Hence the modern editors have had many demands made upon their ingenuity. Mr. Gow gives an interesting illustration from Shakespeare's *Henry V.* (II., 3), where the hostess says of Falstaff: "His nose was as sharp as a pen, and a' babbled of green fields." In the old folios the last four words were printed "*and a table of Green Fields.*" Later editions omitted them as making no sense. One critic suggested "on a table of green frieze," and another, "or as a stubble on shorn fields." The present universally accepted reading is that of Theobald. See Madvig, *Adversaria Critica* (1870); *Emendationes Latine* (1873); Cobet, *Varie Lectiones* (1873); *Collectanea Critica* (1878); Hagen, *Gradus ad Criticem* (1879); Hammond, *Criticism of the New Testament* (1880); Taylor, *History of the Transmission of Ancient Books* (1884); Vincent, *Word Studies in the New Testament* (1889); Gow, *A Companion to School Classics* (2d ed., 1890); and the articles, CODEX, PALEOGRAPHY, WRITING.

TEZCUCO (i.e., "place of detention"), an ancient and much decayed city of Mexico, stands on the e. shore of the lake of the same name in the state, and 16 m. e.n.e. of the city of Mexico. In former times it was the capital of a great state, and was the second city in Mexico. During the early part of the 15th c. the city rose to its greatest splendor. It then contained ranges of stately mansions, in which the nobles resided, and magnificent buildings, which served as the royal residence and as public offices. Tezcuco is now a poor place, filled with heaps of rubbish and ruins. Pop. '80, 15,626.

THACHER, PETER, D.D., 1752-1802, graduated at Harvard college, 1769, was a member of the state constitutional convention, in 1780, was often chaplain to the legislature, and was pastor of a Boston church from 1785 to his death. He wrote many works, among which are *Narrative of the Battle of Bunker Hill*, and *Observations on the State of the Clergy in New England*.

THACHER, THOMAS ANTONY, LL.D., 1815-1886, American educator, was born at Hartford, Conn., graduated at Yale college in 1835; in 1838 was appointed tutor at Yale college, and in 1842, professor of Latin, holding the chair until his death. He edited Cicero's *De Officiis*, Madvig's *Latin Grammar*, etc.

THACKERAY, ANNE ISABELLA. See RITCHIE, MRS. RICHMOND.

THACKERAY, WILLIAM MAKEPEACE, novelist and satirist, was b. at Calcutta in 1811. He was of a good old English family, represented about the middle of last century by Dr. Thackeray, an eminent scholar, and head-master of Harrow. His father was in the civil service of the East India co., and, dying young, he left his son a fortune of £20,000. The latter, when a boy seven years of age, was sent to England, and placed in the Charterhouse school, that ancient Carthusian foundation, which he loved to commemorate in his writings. He next went to Cambridge, but left the university without taking a degree. In 1831 he was at Weimar, and saw Goethe. His ambition was to become an artist, and he traveled over most of Europe, studying at Paris and Rome. His drawings were not without merit; they were quaint, picturesque, and truthful, but somehow they missed the bright touches of a master-hand. He next took to literature, beginning with rare patience and contentment at the lowest step of the ladder. Under the characteristic name of Michael Angelo Titmarsh, or that of Fitz-Boodle, he became a constant contributor to *Fraser's Magazine*, and wrote for it two of the best of his minor works, *The Great Hoggarty Diamond* and *Barry Lyndon*. The latter is the story of an Irish sharper, and is told with a spirit, variety of adventure, and humor worthy of Le Sage or Fielding. Under the pseudonym of Titmarsh he also published *The Paris Sketch-Book* (2 vols. 1840); *The Second Funeral of Napoleon*, and *Chronicle of the Drum* (1841); and the *Irish Sketch-Book* (2 vols., 1843). The greater part of Thackeray's fortune having been spent in foreign travel and unsuccessful speculations at home, he continued to work steadily at literature as a profession. He was never widely popular, but a few

good judges appreciated his keen wit, observation, and irony, and his command of a style singularly pure, clear, and unexaggerated. The establishment of *Punch* afforded a more congenial field for Thackeray, and *Snob Papers* and *James's Diary* were hailed with delight by all readers. Their author's reputation was still more advanced by his novel of *Vanity Fair* (1847-48), published in monthly parts in the style of *Pickwick*, and illustrated by the novelist himself, or, as he expressed it, "illuminated with the author's own candles." During the progress of *Vanity Fair* appeared *Notes of a Journey from Cornhill to Grand Cairo*, being an account of a journey undertaken for the benefit of his health; also *Mrs. Perkins's Ball*, a short Christmas tale, and two works of a similar kind entitled *Our Street*, and *Doctor Birch and his Young Friends*. In 1848 he began a second serial fiction, *Pendennis*, in which much of his own history and experiences are recorded. Next followed *Rebecca and Rowena* (1850), and *The Kicklegurys on the Rhine* (1851). The latter work was sharply criticised by the *Times*, and Thackeray replied in a caustic and humorous *Essay on Thunder and Small Beer*, prefixed to a second edition of the satirical sketch. In 1851 the indefatigable novelist delivered a course of lectures on the *English Humorists of the Eighteenth Century*—light, graceful, discriminating sketches, with passages of real power and eloquence. In 1852-55 appeared two more novels, the most richly imaginative and highly finished of his works, *Esmond* and *The Newcomes*. These were followed by *The Virginians* (a much inferior novel), by *Lectures on the Four Georges* (first delivered in America), by *Lovel the Widower* and *Philip* (two short tales of somewhat coarse texture), and by a series of pleasant gossiping essays, entitled *Roundabout Papers*. These originally appeared in the *Cornhill Magazine*, of which Thackeray was for a time editor; and in the same miscellany he had begun and published part of a new novel, *Dennis Duval*, which promised to be one of the most carefully elaborated and successful of his works of fiction. He contemplated also *Memoirs of the Reign of Queen Anne*, which would have served as a continuation to Macaulay's *History*. He knew that period well, from his previous studies for *Esmond*, and as a moral anatomist and master of English he stood unrivaled. But, alas! such dreams and anticipations were suddenly dispelled. To the grief of all lovers of genius and of manly and noble character, Thackeray was cut off in the fullness of his powers in his 52d year, dying alone and unseen in his chamber before daybreak on the morning of Dec. 24, 1863. His medical attendants found that death was caused by effusion on the brain, and that his brain was one of the largest, weighing no less than 58½ ounces.

In his delineation of the character and genius of Fielding, Thackeray has drawn his own. He had the same hatred of all meanness, cant, and knavery, the same large sympathy, relish of life, thoughtful humor, keen insight, delicate irony, and wit. There was, however, one personal difference: Fielding was utterly careless as to censure of his works, whereas his successor was tremblingly alive to criticism, and was wounded to the quick by the slightest attack. His morbidly delicate organization made him exquisitely susceptible of either pain or pleasure. He had suffered much from physical maladies and from domestic calamity; and his earlier works, especially his *Vanity Fair*, were tinged with a degree of cynicism which seemed to countenance the charge of his unfriendly critics, that he delighted in representing the baser side of human nature, and was skeptical as to the existence of real virtue in the world. His strength lay in portraying character rather than inventing incidents; and in Becky Sharp, Col. Newcome, Harry Foker, Laura Pendennis, and Paul de Florac, to say nothing of the picaroon, Barry Lyndon, he has left us a living gallery, certainly not surpassed by any modern novelist. In his later writings the dark shades no longer preponderate. The mellowing influence of years and sickness, and calmer as well as more extensive observation of life, had sunk the merciless satirist in the genial humorist and philosophic observer. He had still ample scorn for falsehood and vice, and satire for folly and pretense; but he had also smiles and tears, and tenderness and charity, that gave a moral beauty and interest to the last decade of his brilliant career as an author.

THAIS, an Athenian courtesan, famous for her wit and beauty, who was in Asia along with Alexander the great, and according to Cleitarchus—a doubtful authority—induced the Macedonian king, when excited with wine, to set fire to the palace of the Persian kings at Persepolis. After his death she lived with Ptolemy Lagi, by whom she became the mother of several children.

THALASSIDRO MA. See PETREL.

THALBERG, SIGISMUND, a very eminent pianist, b. at Geneva in 1812, received the greater part of his musical education at Vienna, where he was a pupil of Hummel. He made his first public appearance in 1827, and his *début* in Paris in 1835. After residing for a time in America he returned to Europe, and died April 27, 1871. In graceful and brilliant execution, and in manual dexterity on the piano, he had hardly a rival. His compositions are principally fantasias and variations.

THALEIA, or **THALIA** (Gr. the blooming one), one of the nine muses (q.v.), generally regarded as presiding over comedy. By Apollo, Thaleia became the mother of the Corybantes. See *illus.*, MYTHOLOGY, vol. X.

THALER, a coin in circulation in Germany, Austria, Holland, Belgium, Denmark, Sweden, and Norway. The new German *thaler* of silver is worth \$0.729, the specie

daler of Norway is equal to \$1.107, the *ten-thaler* (gold) of Denmark is worth \$7.861. The value varies in different parts of Germany; the Russian *thaler* is worth 71 cents. The word *thaler* is thought by some to be taken from the name of a mining town in Bohemia, called Joachimsthal (Joachim's dale), in which these pieces were coined, and that they were first known as *Joachimsthaler* and then for brevity *thaler*. German scholars derive the term *thaler* from *talent*, signifying a pound of gold. In the early part of the 16th c. the silver coins in use at Joachimsthal weighed 1 ounce. In Sweden the *rigsdaler riksmünt* is about 27 cents. In Denmark the *rigsbank daler* is about 54 cents. In Germany generally the *thaler* of account is from about 69 cents to 73 cents, American currency. In other countries the *Laufthaler* or leaf dollar is in use; the *Philippsthaler*, the Swedish copper dollar, and in Spain the *dalera*, the Spanish pillar dollar, which was taken as the basis of the United States coinage and money of account. In most European countries the mints have coined *thalers* (varying in value with the locality), hence called *rigsdaler* or *reichsthaler*, the dollar of the realm.

THALES, an early Greek philosopher, founder of the Ionic or physical school of philosophy, and one of the seven wise men (q.v.), was a native of Miletus, in Asia Minor, and flourished toward the close of the 7th c. B.C. Very little is known regarding his life. He is said to have recommended the Ionians, who were menaced by the Persians, to form a federation against their powerful enemy, and to select Teos as the capital. At a later period, we are told he induced the Milesians to withdraw from a union with Cræsus against Cyrus. He is also said to have predicted the eclipse of the sun which happened in the reign of Alyattes. His claim to the title of sage (as in the case of his compeers) was due to his practical wisdom rather than to his speculative achievements. Nevertheless, Thales has a name in the history of speculative philosophy. He is even regarded by some as the first Greek that speculated on the constitution of the universe. According to him, the original principal of all things is water, from which everything proceeds, and into which it is again resolved. It would appear also that in connection with this doctrine he had some idea of a soul or force in water productive of all the phenomena we see, but it is impossible to ascertain the extent of his belief in an immaterial power. Most probably, his philosophy was a form of pantheism, rather than of theism. None of Thales' speculations was committed to writing, and it is only from the notices of later Greeks, such as Herodotus, Aristotle, etc., that we can gather an idea of the character of his thinking.—See Ritter's *Geschichte der Ionischen Philosophie* (Berl. 1831), Lewes's *Biographical History of Philosophy*, and prof. Ch. A. Brandis, in Smith's *Dic. of Gr. and Rom. Biog.*, art. "Thales."

THALLIUM (symb. Tl, equiv. 203.6, spec. grav. 11.9) is a metal which derives its name from the Greek word *thallos*, green, because its existence was first recognized by an intense green line appearing in the spectrum of a flame in which thallium is volatilized. It was discovered by Mr. Crookes, the editor of the *Chemical News*, in 1861, in the seleniferous deposit of a lead chamber of a sulphuric acid factory in the Hartz mountains, where iron pyrites is employed for the production of the acid. In the following year, it was obtained in larger quantities from a similar source by M. Lamy, who exhibited magnificent specimens of it in solid bars at the last great exhibition in London. Thallium is slightly heavier than lead—a metal which it resembles in its physical properties. It is very soft, being readily cut with a knife, or drawn into wire; and its freshly-cut surface exhibits a brilliant metallic luster and grayish color, somewhat between those of silver and lead. In contact with the air, it tarnishes more rapidly than lead, and becomes coated with a thin layer of oxide, which preserves the rest of the metal. It fuses below a red heat, and is soluble in the ordinary mineral acids. With oxygen, it enters into two combinations—viz., *Thallium monoxide*, Tl_2O , which is a black powder, soluble in water. It is basic, and its salts with acids are called *thallious salts*; and *Thallium trioxide*, Tl_2O_3 , which is insoluble in water and the alkalies, may be obtained as a dark reddish powder, and forms *thallic salts* with acids.

There is a difference of opinion as to whether the salts of thallium are or are not powerful irritant poisons. Lamy (with the view of testing the statement of Paulet, that the salts are poisonous) dissolved 75 grains of the sulphate in milk; and he found that this quantity sufficed to destroy two hens, six ducks, two puppies, and a middle-sized bitch. In one experiment, a grain and a half proved fatal to a puppy. Mr. Crookes, on the other hand, although much exposed to the fumes of this metal, suffered no particular effects from them; and he swallowed a grain or two of the salts without injury. He found that the latter have a local action on the hair and skin, staining the former, and rendering the latter yellow and horny.—For further details regarding this metal, the reader may consult Mr. Crookes's memoirs in the *Philosophical Transactions* for 1862, and in the *Chemical News*, and Lamy's memoir in the *Annales de Chimie et de Physique* for 1863.

THALLOGENOUS PLANTS are those acotyledonous plants which exhibit the greatest simplicity of structure, consisting of a mere thallus (q.v.) with reproductive organs. Of this description are *algæ*, *characeæ*, *fungi*, and *lichens*. When apparent leaves exist in any of these, they do not exhibit the symmetry always found in true leaves; and although some of them have stems or stalks, which attain, as in some sea-weeds, both to a considerable age and to great strength, all is composed of cellular tissue without any proper woody fiber.—In the botanical system of Lindley, the thallogenous

plants form a class, under the name *thallogens*; and in that of Endlicher, a corresponding place is assigned to them under the name *thallophyta*.

THALLUS, in botany, a structure composed of cellular tissue, without woody fiber, which in some of the lower cryptogamic orders, as *algæ*, *fungi* and *lichens*, constitutes the whole plant, except the reproductive organs, which are situated in or upon it. The thallus assumes very various forms, sometimes crust-like, sometimes spread out like a leaf, simple, lobed, or branched; or, as in mushrooms, it becomes a stalk, cap, and gills.

THAMES, a river formed by the union, at Norwich, Conn., of the Yantic, Quinebaug, and Shetucket rivers. The course of the river is s., and it enters Long Island sound 3 m. below New London and 15 m. from the junction of the three rivers. The river, a picturesque tidal channel, is navigable for its full course, and its mouth forms New London harbor.

THAMES (Lat. *Tam-esis*; the root *tam* probably meaning broad, and *esis* or *isis*, being identical with *esk*, *ex*, *ouse*, etc., all from Cel. *uisg*, water), the most important river of Great Britain, and the longest in England, flows e.s.e. across the s. portion of the country. Its remotest springs—those of the upper waters of the Churn—rise on the s.e. slope of the Cotswold hills, 3 m. s. of Cheltenham, and 7 m. w. of the Severn at Gloucester. The springs unite about a m. from their sources, and form the Churn, which flows s.e. 20 m. to Cricklade, and there receives the Thames, which joins it from the w. after a course of 10 miles. The Thames, or Isis, then flows e.n.e. for about 35 m., when, curving s.e., it passes Oxford, and flows on to Reading, where, after receiving the Kennet from the w., it again changes its course; and with a generally eastward course, it passes Windsor, Eton, Richmond, London, Woolwich, and Gravesend, a few miles below which it expands into a wide estuary, and enters the North sea. The length of the Thames is estimated at 250 m., the area of its basin at upward of 6,000 sq. miles. Throughout the greater part of its course, it is of importance as forming the boundary-line between several of the southern counties. Passing Cricklade, it forms part of the northern boundary of Wilts, and below this point it separates the counties of Oxford, Buckingham, Middlesex, and Essex on the n. from those of Berks, Surrey, and Kent on the s., except certain outlying bits of some of these counties. Its chief affluents are the Colne, Leach, Windrush, Cherwell, Thame, Colne, Lea, and Roding, on the left; and the Kennet, Loddon, Darent, Mole, and Medway, on the right bank. At Vauxhall bridge, the width of the river is about 230 yards; at London bridge, 290 yards; at Woolwich, 490 yards; at Gravesend pier, 800 yards; 3 m. below Gravesend, 1290 yards; and at its mouth, between Whitstable and Foulness Point, about 8 m. below the Nore, it is 18 m. across. At the Nore Light, the commonly reputed mouth of the Thames, the breadth is 6 miles. The river is navigable for barges to Lechlade, upward of 200 m. above its mouth, and it is connected with the Thames and Severn, Oxford, Wilts and Berks, Grand Junction, and several other important canals, by means of which it maintains free communication with the w. and s. coasts, and with all parts of the interior of the country. Vessels of 800 tons can reach St. Katharine's docks, while those of 1400 tons can ascend to Blackwall, 6 m. below London bridge. The part of the river immediately below London bridge is called the *Pool*; and the part between the bridge and Blackwall is called the *Port*. Two embankments have been formed, one on the n. shore from Blackfriars bridge to Westminster, and one on the s. shore from Westminster bridge to Vauxhall. See LONDON.

THAMES, BATTLE OF THE, at the Moravian settlement on the Thames river, Ontario, Can., Oct. 5, 1813; between the American forces under Gen. William H. Harrison, and the British under Gen. Proctor, with 2000 Indian allies under Tecumseh. Tecumseh was killed during the battle. The charge of the cavalry under Col. Richard M. Johnson began and decided the battle, in which 600 British prisoners were taken, besides, stores, cannon, etc. See TECUMSEH, and HARRISON, WILLIAM HENRY.

THANE, or **THEGN** (A.-S. *thenien*, analogous to Ger. *dienen*, to serve), a title whose use in the early feudal ages has been the subject of much discussion. In England, in Saxon times, the king's thane was a "miles emeritus," who, on the cessation of his actual service about the king's person, received a benefice or grant of land. The term "miles," when used by Bede, is uniformly rendered "cyninges thegn" by his Saxon translator. In the 10th c., all who would, in the feudal era, have been known as tenants *in capite*, were thanes. After the conquest, thanes and barons are classed together; and in Henry I.'s time the terms seem to be used synonymously. The office or dignity appears to have been attached to particular estates; thane lands are frequently mentioned in Domesday. After the reign of Henry II., the term fell into disuse. The title thane was introduced at a later period into the northern parts of Scotland, where, however, it did not express the same rank and dignity as in England; the tenure not being military, but in fee-farm.—The Scottish thane seems to have been a hereditary tenant, paying the sum at which the land stood in the king's rental, and retaining his ancient authority strengthened and legalized. The title was in occasional use in Scotland down to the end of the 15th century. Hector Boece's notion of the Scottish thanes being all made earls, which has been adopted in Shakespeare's *Macbeth*, is devoid of historical foundation.

THANET, ISLE OF, forms the north-eastern corner of the county of Kent (q.v.), from the mainland of which it is cut off by the river Stour and its branches, and is bounded on the n. and e. by the sea. It is 10 m. in length, and from 4 to 8 m. broad; and contains 26,500 acres, of which 23,000 are arable, and 3,500 in marsh and pastures. The surface is high, but in the main, level; the soil is in general light and chalky; the island, however, is rich and fruitful—agriculture being successfully pursued. Besides the ordinary crops, canary and radish seeds are largely grown. Pop. '91, 57,600.

THANET, OCTAVE. See FRENCH, ALICE.

THANKSGIVING DAY is chiefly an American institution. After the first harvest of the New England colonists in 1621 Gov. Bradford made provision for their rejoicing specially together with praise and prayer. In 1623 a day of fasting and prayer in the midst of drought was changed into thanksgiving by the coming of rain during the prayers; gradually the custom prevailed of appointing thanksgiving annually after harvest. These appointments were by proclamation of the governors of the several New England states. During the revolution a day of national thanksgiving was annually recommended by congress. Of late years, the custom of appointing a Thanksgiving day by the governors of states, long confined to New England, has been adopted through the country, the President's proclamation, however, usually appearing first. See Love, *The Fast and Thanksgiving Days of New England* (N. Y., 1895).

THANN, a t. of Germany, in the province of Alsace-Lorraine, at the foot of a hill crowned by the ruins of the castle of Engelburg, 13 m. w.n.w. of Mulhouse. It contains a superb Gothic church, surmounted by a spire of delicate open work, upward of 300 feet high. Cotton cloths, chemicals, and machinery are manufactured. Pop. '95, 7537.

THASOS, the most northerly island in the Ægean sea, a few miles off the coast of Macedonia. Circumference about 40 miles; pop. about 12,400, scattered over a dozen villages. Thasos is mountainous, and, on the whole, barren. The description of it given by Archilochus is still applicable: "An ass's backbone overspread with wild wood." It exports some oil, honey, and timber. In ancient times the island was famous for its gold mines, which appear to have been worked from a very remote antiquity.

THATCHER, HENRY KNOX, 1806-80; b. Thomaston, Me., grandson of Gen. Henry Knox, entered the navy as midshipman, 1823; rose through successive grades to capt., 1861; commander, 1862. He commanded the frigate *Constellation* in the Mediterranean, 1862-63, the steam frigate *Colorado*, n. Atlantic blockade squadron, 1864-65. He distinguished himself in the attacks on Fort Fisher under Porter, 1864-65, and in the siege of Mobile under Farragut, co-operating with Gen. Canby in 1865, receiving the surrender of the confederate naval force in Mobile bay; appointed rear-admiral, 1866, for gallantry in this action; retired, 1868; residing at Winchester, Mass., and Nahant. He was at one time commandant of the Charlestown navy-yard, a member of the Bunker Hill Monument association, and pres. of the Massachusetts society of the Cincinnati, succeeding his grandfather in membership.

THAXTER, CELIA (LAUGHTON), poet, was born at Portsmouth, N. H., in 1836. Her father was the lighthouse keeper of the White Island light on the Isles of Shoals, and she drew much of the material of her prose and verse works from the sea. In 1851 she married Levi L. Thaxter. She wrote *Among the Isles of Shoals* (1873); *Poems* (1874); *Drift-wood* (1878); *The Cruise of the Mystery* (1886); *An Island Garden* (1894). She died in 1894.

THAYER, a co. in s.e. Nebraska, adjoining Kansas; drained by the Little Blue river and Big Sandy creek; traversed by the Chicago, Rock Island, and Pacific, and the Burlington Route railroads; 576 sq. m.; pop. '90, 12,738. Co. seat, Hebron.

THAYER, ABBOTT HENDERSON, an American artist, born in 1849. He studied in Paris under Gerôme and Lehmann, and received a medal at the Paris exposition of 1889. He was elected a member of the society of American artists in 1879. He has painted, notably, a "Virgin Enthroned" and a "Madonna," and many pictures of flowers.

THAYER, ARTHUR WILDER, American composer, b. in Dedham, Mass., Aug. 26, 1857. He studied singing under Charles R. Adams, harmony, counterpoint, and instrumentation under George W. Chadwick, and conducting under Karl Zerrahn. After conducting choral societies in Lowell, Salem, Worcester, Providence, and other towns, he was superintendent of music in the public schools of Dedham and Milton. He is now director of music at Eliot Church, Newton, and a member of the Howard Musical Association. His works are chiefly songs and part-songs, many of which were written for the Apollo Club of Boston. They include: *Rosalind's Madrigal*; *Bugle Song*; *Sea-Greeting*; *Muleteer's Song*; *The Quiet Moon upon the Clouds*; and *My Sweet Sweetying, Beware*.

THAYER, JOSEPH HENRY, D.D., b. Boston, 1828; educated at Harvard college and Andover theological seminary; for a short time pastor of a Congregational church in Salem, Mass., and an army chaplain. In 1864 he became associate professor of sacred literature in Andover theological seminary, and in 1884 in Harvard divinity school. A translation of Winer's *New Testament Grammar* and of Buttmann's *New Testament Grammar* are among his published works.

THAYER, SIMEON, 1737-1800; b. Mass.; served in the French and Indian war, 1756-57, and was taken prisoner at Fort William Henry. On the outbreaking of the revolution he received a capt.'s commission, and was with Arnold in the Quebec expedition, where he was made prisoner. After his release he did gallant service at Red Bank, Fort Mifflin, and the battle of Monmouth, where he was severely wounded. In 1781 he left the army. He wrote a *Journal of the Invasion of Canada in 1775*.

THAYER, SYLVANUS, 1785-1872; b. Mass.; educated at Dartmouth college and at West Point. He was appointed to the engineers, served through the war of 1812, and was chief engineer of Gen. Dearborn, Gen. Hampton, and Gen. Porter, successively. Visiting Europe on professional duty, he witnessed the movements of the allies before Paris, and studied the military systems of France and other countries. He was superintendent of the U. S. military academy, 1819-33, and raised it to a high standing. He afterwards supervised the construction of the defenses of Boston harbor. In 1857-58 he commanded the corps of engineers. He was retired in 1863 with the rank of col. He founded the Thayer School of Civil Engineering at Dartmouth college, and a free public library in his native town of Braintree.

THAYER, THOMAS BALDWIN, D.D., b. Boston, 1812; educated in Boston; pastor of a Universalist church, Lowell, Mass., 1833-45; and in Brooklyn, N. Y., 1845-51; returned to Lowell, 1851; settled in Boston, 1857-69. He was editor of the *Universalist Quarterly*; and published *Christianity against Infidelity*; *The Theology of Universalism*. He d. 1886.

THEA. See TEA.

THEATER, a place for public representations, chiefly of a dramatic or musical description. Theaters are of very ancient origin. They were found in every Greek city, both at home and in the colonies, and many very interesting specimens of the Greek theaters still exist in very good preservation. These were not built like modern theaters, with tiers of galleries rising one over the other, but were constructed with concentric rows of seats rising in regular succession one behind and above the other like the steps of stairs. These seats were frequently cut in the solid rock; and a place where the natural curve and slope of the ground rendered such excavation easy, was generally chosen. The seats, or audience department, were arranged in a semicircular form. In the center, at the lowest point, stood the orchestra; and the proscenium, or place for the dramatic representation, formed the chord of the semicircular auditorium. Behind this was the scena; closing in the building was a solid wall, generally ornamented with pillars, cornices, etc. There was no roof, but the audience was probably protected from the sun's rays by a curtain stretching across the theater. This form of theater was also that adopted by the Romans, who built or excavated large theaters in many of their important towns. The theaters of the Romans differed from their *amphitheaters* (q.v.), the former being semicircular, the latter oval, and with seats all round. Of the theaters still remaining, that of Orange, in the s. of France, is one of the finest, the auditorium being 340 ft. in diameter. During the middle ages, theaters were unnecessary, and were never built. The few dramatic performances then in use, which were chiefly of the nature of holy mysteries, were represented in the cathedrals. From the remains still existing, however, there would seem to have been large open-air theaters at an early age in this country. Of these Piran Round in Cornwall is the best example. It is circular, with raised platforms all round for spectators, after the manner of the Greek theaters. With the revival of classical literature in the 16th c., the classical drama was also reproduced, and naturally along with it the classical form of theater. The first specimens of what may be called modern theaters (although founded on the old Greek model, according to Vitruvius's description) were the Teatro Olympico, erected by Palladio in Vicenza; a similar one in Venice, also by Palladio; and another in Vicenza, by Serlio. In Italy and Spain, open court-yards, with galleries round them, were at first the scenes of dramatic performances. In France and England, where the climate did not so readily admit of open-air representations, the first plays performed were exhibited in tennis or racket courts, in which there were usually galleries at one end; and as this accommodation was found too limited, these were afterward carried along the sides also. But dramatic literature soon became so important that buildings had to be designed for the express purpose of its representation. Accordingly, in Paris, the theater of the Hôtel de Bourgogne was erected in the beginning of the 17th century. It was rebuilt, 1645, with tiers of boxes on a square plan. In 1639, the theatre of the Palais Royal was erected by Richelieu, and was long considered the best model. The present circular plan of the galleries, with pit sloping backward, seems to have been first introduced in Venice in 1639; and the horseshoe form of the boxes was first carried out by Fontana in the Tordinoni Theatre, at Rome, in 1675. The modern form of the auditorium was thus invented, and gradually improved and perfected, till in about a century similar theaters were erected all over Europe; the Scala Theater at Milan, the largest in Italy, and the great theater at Bordeaux, being built, the former in 1774, and the latter in 1777. The plan of the Scala Theatre at Milan shows the general disposition of all the parts of the modern theater on the largest scale. Modern theaters are all very similar in their general distribution. They are divided into two distinct departments—viz., the auditorium or audience department, and the stage or scenic department. In the former, the seats are invariably arranged on a sloping ground-floor or "pit;" and on several tiers or galleries, extending in a semicircular or

horse-shoe form round the house. On the ground-floor, the front rows of seats are generally set apart as "dress stalls," and the back part only is then called the "pit." In opera-houses, the stalls generally occupy the greater portion of the space, and the "pit" is reduced to a minimum. In dramatic theaters, the tiers of galleries have the floors arranged in stages, rising above one another in such a manner as to enable the spectators all to see over those before them to the front of the stage. In theaters for operatic representation, the galleries have the floors laid level, and are divided all round into private boxes. The top tier is, however, sometimes left partially open, and has the seats on stages. In the larger opera houses, there are usually retiring-rooms connected with each of the private boxes. There is also a "crush-room," or large saloon, in which the audience may promenade between the acts. In all French theaters and opera-houses, these saloons, or *foyers*, are very large, and elegantly fitted up. They are almost always over the entrance-hall. In some of the modern French theaters, there are two foyers, one over the other, for the different classes who occupy the dress circle and the upper galleries. The question has often been raised as to the best form for a theater, both for hearing and seeing. It is a most difficult question to decide theoretically as regards hearing, but it is quite clear that the old semicircular plan of the Greeks is as nearly as possible the best for seeing, as it places the seats all round at an equal distance from the center of the proscenium; and therefore we find, where seeing well is all-important, as, for instance, in a *lecture theater*, this old form is usually adopted. In an oblong house, on the other hand, the seats at the center of the galleries are much further removed than those at the sides from the center of the stage, and are thus at a disadvantage as regards hearing; while the side boxes are badly placed for commanding a view of the stage. The entrances and staircases of theaters are not generally so well arranged or so spacious as they should be. In French theaters, this is especially the case. In these, there is often only one narrow wooden stair on each side of the house, leading to all the galleries. Recent accidents by fire, and the risk the audience runs in case of want of proper exits, have drawn attention to this subject, and the legislature will probably determine that there must be a separate, wide, and easy stair to each gallery—as, indeed, there usually now is in theaters recently built in this country. For large galleries, these stairs should be at least six feet wide; and a strong iron hand-rail down each side of the stair would be found useful in case of a panic, to prevent a fatal crush. Besides the main passages for the use of the public, there ought to be private passages and doors leading to every part of the house, so that the manager may pass with ease to any point in the audience where his presence may be required.

The orchestra occupies the space immediately in front of the proscenium, and this space is arranged so as to be capable of being enlarged or contracted as occasion may require. The proscenium is a small portion of the stage which projects a few feet in front of the curtain, so as to enable the actors to stand well forward, that they may be distinctly heard by the audience. The part of the house on either side of the proscenium is that on which there is usually the greatest amount of ornament. The sides and ceiling of the proscenium form, as it were, the frame through which the picture represented on the stage is seen; and as on it every eye must rest, it is made more ornate than the rest of the auditorium. The ceiling, presenting as it does a large broad surface, and being well seen from many parts of the house, is also a place well adapted for ornament, and is generally made as handsome as possible. The same remark applies to the fronts of the dress circle and galleries. The stage extends backward from the proscenium, and ought to be of considerable depth, so as to admit of the scenic effects, dissolving scenes, etc., now so much run upon. The great length of the stage from front to back is one of the most striking differences between the modern and the ancient theater, and arises entirely from the introduction and development of movable scenery—an invention of the architect Baldassare Peruzzi, and first used in Rome before Leo X., in 1508. The floor of the stage is not laid level like the floor of a room, but is sloped upward from front to back, so as to elevate the performers and scenes at the back, and render them more easily seen. The inclination of the stage is generally about half an inch to every foot. The stage department of a theater not only requires to be very long, but also very lofty above, and deep below the stage, so as to allow the large frames on which the scenes are stretched to be raised or lowered in one piece. The stage itself is a most complicated piece of mechanism, a considerable part of it being made movable either in the form of *traps*, for raising or lowering actors, furniture, etc., or in long pieces, which slide off to each side from the center, to allow the scenes to rise or descend. There are also *bridges*, or platforms constructed for raising and lowering through similar openings, some of them the full width of the stage. The traps and bridges are almost all worked by means of balance-weights, and the slides by ropes and windlasses. Besides the large *frames* above described as containing pictures occupying the full opening of the stage, there are other scenes which are pushed from the sides to the center, each being only one-half the width of the opening. These are called *flats*, and usually slide in grooves above and below. The grooves are arranged in clusters at intervals, having clear spaces between, called the *entrances*, through which the actors pass on and off the stage. But in modern French theaters and in the opera-houses—such, for instance, as Covent Garden theater—these grooves are regarded as an incumbrance to the stage, and are entirely done away with. Their place is occupied by narrow openings or *sits* in the stage, below which are

blocks running on wheels, and containing sockets, into which poles are dropped from above, and to these the flats are attached. Another advantage of this system is, that the gas-wings and ladders may be made movable, and slip backward and forward in the same manner as the flats. When occasion requires, the whole stage can thus be entirely cleared. According to the old plan of fixed grooves, only the center of the stage can ever be cleared without unscrewing all the grooves, and the gas-wings must always remain in the same relative position. Besides the flats, there are also smaller scenes which move in the grooves. These are called *wings*, and are used to screen the entrance. Corresponding to the wings are similar narrow scenes dropped from above: these are called *borders*, and are used to hide the gas-battens. These and the scenes which are drawn up, the gas-battens, etc., are all worked by means of ropes from the *flies*, or galleries running along the sides of the stage at a high level. The ropes from these passing up into the barrel-loft (a space in the roof filled with large drums and barrels on which the ropes are coiled) and down again to the flies, form a complication which seems to the uninitiated observer an inextricable mass of confusion. While such is the usual arrangement connected with movable scenery, it is to be noted that latterly a very great change has been introduced into the higher class of theaters. This change consists in the dismissal of wings or sliding side portions of scenes with intervening gaps, and substituting for them large pieces of scenery resembling the sides and further end of a room—an arrangement every way more natural. In cases of this improved kind, the actors enter on the stage and depart by doors. In connection with the stage, it is usual to have a large space set apart for containing scenery, called the *scene-dock*. This is frequently placed at the back of the stage, and may, on occasion, be cleared out, to give extra depth to the scene. There are also numerous apartments required in connection with the stage for the working of the theater—such as manager's room; dressing-rooms for the actors and actresses; the "green-room," in which they assemble when dressed, and wait till they are called; "star-rooms," or dressing-rooms for the stars; the wardrobe, in which the costumes are kept; furniture stores, scene stores; "property"-makers room; and workshops for the carpenter, gas-man, etc. There must also be a good painting-room, which must necessarily be a large apartment, from the size of the pictures which have to be painted—each being the full size of the opening of the stage. The canvas for these scenes is stretched on frames, which move up and down by means of a winch with balance-weights; and thus the painter stands comfortably on the floor, and moves his picture up or down, so as to get at any part he wishes. An interesting point on the stage is the prompt corner, from which the prompter has command of all the lights of the house, and bells to warn every man of his duty at the proper moment. He has a large brass plate, in which a number of handles are fixed, with an index to each, marking the high, low, etc., of the lights; and as each system of lights has a separate main pipe from the prompt corner, each can be managed independently. The side of the house on which the prompter is seated is called the "prompt side," and the other side is called the "O. P." or *opposite* side.

The house, or auditorium department, is generally lighted by means of a large luster or sun-light in the center of the ceiling, and much of the effect of the building depends on how this is managed. There are also usually smaller lights round one tier of the boxes at least. The proscenium is lighted by a large luster on each side, and by the foot-lights, which run along the whole of the front of the stage. These are sometimes provided with glasses of different colors, called mediums, which are used for throwing a red, green, or white light on the stage, as may be required. The stage is lighted by rows of gas-burners up each side and across the top at every entrance. The side-lights are called *gas-wings*, or *ladders*; and the top ones, *gas-battens*. Each of these has a main from the prompt corner. They can be pushed in and out, or up and down, like the scenery. There is also provision at each entrance for fixing flexible hose and temporary lights, so as to produce a bright effect wherever required. The mediums for producing colored light in this case are blinds of colored cloth. Another means of producing brilliant effects of light is the lime-light, by which, together with lenses of colored glass, bright lights of any color can be thrown on the stage or scenery when required.

Theaters are usually either very cold or insufferably hot. This arises from want of proper means of heating, and insufficient ventilation. The center luster is the great cause of ventilation, the draught caused by its heat drawing off the foul air at the ceiling. The suction caused by this withdrawal of air is naturally supplied from the great body of air in the stage. The stage ought, therefore, to be moderately heated by means of hot-water pipes or otherwise, so as to prevent cold draughts. The passages and lobbies round the house should also be heated in the same way, so that any air drawn in to the house may be properly tempered. An attempt has been made in Paris, of late years, to obviate the great heat and draught caused by the center luster, by doing away with the luster, and making the ceiling partly of glass, with powerful lights and reflectors behind the glass in the roof. This mode of lighting is, however, of rather a subdued character for a theater, although very appropriate to such chambers as the house of commons, where it acts admirably. In Paris they have also tried to supply fresh air from the gardens outside by means of a large tube, from which numerous small tubes branch and distribute the fresh air all round the theater from the fronts of the boxes round the proscenium, etc. The idea is an excellent one, and is said to answer well practically.

There is a novel and agreeable class of theaters now in use in Germany, but of which there are no specimens in this country. It consists of a double auditory, one at each end of the stage. One of these auditories is arranged and lighted in the usual manner, and is called the winter theater. The other auditory is called the summer theater, and is so arranged that performances may be represented in daylight during the summer season. It is lighted by large windows in the outer wall, which corresponds in form to the interior curves of the galleries, and also by windows in the roof. The entrances are by means of staircases at each side, near the proscenium, and by wide corridors and balconies round the curve of the exterior wall. One of the most effective of these summer-theaters is the Victoria in Berlin, by Zitz.

The art of *dramatic representation* has undergone great changes. In ancient Greece, partly from the character of the subjects selected, and partly from the origin of the drama itself, costume and acting were conventional, artificial, and stereotyped. On this point, we quote the words of Witzschel, who has written a handbook for students on the Athenian stage. (Eng. transl. by Paul; ed. by T. K. Arnold, Lond. 1850): "There can be no doubt," says he, "that the somewhat fantastic costume which was handed down without any change from one generation of actors to another was closely connected with the religious character of their tragic performances. The peculiar fashion and brilliant colors of the tragic wardrobe belonged rather to the Dionysian solemnities than to the stage. That Æschylus, by whom the greater part of it was invented, kept steadily in view the original intention of tragedy is evident from the notices which we find in ancient writers of his theatrical dresses having been worn in other religious ceremonies and processions. It is only reasonable to suppose that he would have given to the tragic stage a wardrobe of a very different description had he not been influenced by the conviction, that theatrical performances were in some sort a religious ceremonial. Another proof of the feeling entertained on this subject may be found in the ridicule with which Aristophanes overwhelms Euripides for introducing his heroes, not only in pitiable situations but in dirty, ragged, and beggarly weeds, to the great disgust of all true-hearted Athenians, and the utter annihilation of tragic ideality. In the *Acharnenses*, the whole of the tragic poet's squalid wardrobe is held up to public derision.

"The tragic costume for male characters of the highest rank consisted of an embroidered tunic with sleeves, which, in the older personages reached to the feet (*chiton poderes*), and in the younger to the knees. Over this was thrown a green pall, or long mantle (Gr. *surma*, Lat. *palla*), which also reached to the feet, and was richly ornamented with a purple and gold border. Persons of high but not royal rank wore a shorter red mantle, embroidered with gold, which was partially covered by a richly-embroidered, high-fitting scarf. Soothsayers wore over the tunic a kind of a network, composed of woolen threads. A sort of waistcoat (*kolpōma*) was also worn over the tunic. This was the costume of powerful and warlike sovereigns, such as Atreus, Agamemnon, etc. Dionysus (Bacchus) appeared in a purple tunic, which hung negligently from an embroidered shoulder-knot, and a thin, transparent, saffron-colored upper robe, with a thyrsus in his hand. Even Hercules himself was not the athletic hero of the old mythology, with a lion's skin thrown loosely round his muscular limbs, but a solemn, theatrical personage, enveloped in a long mantle. The costume of a queen was a flowing purple robe, with a white scarf; and for mourning, a black robe, and blue or dark yellow shawl. Persons in distress, especially exiles, wore dirty-white, dark-gray, dingy-yellow, or bluish garments. . . . To increase their height, the tragic performers wore the cothurnus, a sort of buskin, with high soles and still higher heels, which compelled them to walk with a measured and sounding tread; and a top-knot of hair, or toupet (Gr. *ongkos*), suitable to the age and condition of the character represented. A corresponding breadth of figure was produced by means of padding and by a sort of glove. Thus equipped, the tragic hero seemed a giant as compared with ordinary mortals. Lastly, they had the mask, a part of the ancient theatrical costume which seems to us so strange and unnatural. For its meaning and origin we must go back to the Dionysian festival, at which the excited crowd were wont, in honor of the jolly god, to smear their faces with lees of wine; and at a later period, when dramatic interludes were attempted, with vermilion, or to cover their cheeks with rude masks of bark. In the course of time these primitive inventions were discarded, and their places supplied by linen masks, characteristically painted. For the sake of retaining this uncouth but distinctive appendage of the Dionysian festival, the Greeks were content to forego the delicate expression of feeling and eloquent play of features which are indispensable to a modern actor; but on the other hand, when we remember the enormous size of their theaters, which scarcely permitted the assembled thousands to hear what was said by the actors, still less to distinguish their features, we are forced to acknowledge that the practice of wearing masks was rather an advantage than an inconvenience." The above description is, in the main, applicable to the Roman as well as the Greek theaters. The only additional point which it is necessary to notice is that, among the ancients, the acting of plays was not (as it is now) a regular and daily, but only an occasional affair, at festival seasons and the like. With the fall of the western empire, the disappearance of classic paganism and classic tastes, and the triumph of the Christianised barbarians of the n. and e., theatrical performances ceased. But the liking for such things is not artificial; it is natural and irrepressible; and gradually, as the ancient culture resumed

something of its former sway, efforts were made, not indeed, to re-enact the majestic tragedy of Greece (for its language was scarcely known), or the pungent comedy of Rome, but to throw into dramatic form the "mysteries," "miracles," and "moralities," of the Christian religion. The rudeness of these mediæval plays may perhaps suggest to us what Greek performances were before the days of Thespis. In fact, they were introduced as a means of edifying, as much as of amusing, the ignorant laity, were customarily the works of monks, and were performed on festive occasions in the churches. It does not, however, appear that they were accompanied by any *scenico* representations. A raised wooden stage like that which forms the front of a traveling show, was all that the untutored taste of the times demanded. Nor are we to suppose for a moment that the slightest attention was paid to propriety of costume or speech. The personages rather than the actions, the ceremony rather than the dialogue, the moral rather than the matter, were the things looked to, and hence no subtle or artistic representation of life and character was possible. The development of the modern drama (q.v.) ultimately restored the art of the actor to its ancient dignity and importance; but it was long before those changes took place that gave theatrical performances their modern character. Good acting—that is to say, skillful impersonation of character and varied elocution—became quite common in England after the restoration, and was not unknown before it; but appropriate costume and scenery were scarcely thought of until the time of Talma (q.v.), toward the close of last century. Since then the best theaters have displayed a most creditable desire to reproduce, with something like verisimilitude, the outward "form and pressure," the garb, deportment, and air of the age represented.

The latest improvement to prevent delay between the scenes has been introduced in the Madison Square Theater in New York city, which has two stages, one above the other. During the performance of a scene the second stage floor is being prepared in the under-space, with all its scenery fixed, and when the curtain falls the first stage rises into the upper regions and the second floor goes up to take its place. These floors are accurately balanced by heavy counterpoise weights, so that the whole of these enormous masses are moved with comparatively little force.

In addition to the above-mentioned parts of the theatre, which are reserved for the mechanical working of the performance, much space is occupied by the "green-room" for the actors and rows of dressing-rooms. An immense deal of storage-room is also required, and some of the Parisian theatres have large magazines for this purpose in the suburbs. In many cases also the atelier for the scene painters is far removed from the theatre, and thus far better space and lighting for the work can be provided.

The painting of theatrical scenery has frequently been the work of artists of very high talent, such as Raphael in Rome, Watteau, Boucher, and Serrandoni in France, and Stanfield in England. Paintings of very high artistic merit and wonderfully decorative effect are now produced for theatrical purposes, especially in France, Germany, and England. In England, especially, great historical and antiquarian knowledge are brought to the aid of this branch of art. The landscapes, in particular, are sometimes works of great beauty, and very beautiful effects of lake scenery, with trees and mountains reflected in the water, are got by setting great sheets of plate glass over the stage floor, slightly inclined, so that a real reflection is thrown by the landscape painted on the scene behind. Another ingenious device, used by Wagner at Baireuth and also in England for magical scenes, was to form a thin and semi-transparent curtain of vapor, which was sent up by a perforated steam-pipe concealed in a groove in the stage.

The various methods of lighting used are an important item in the production of striking effects. The old system of a row of "foot-lights," with their unpleasant upward shadow, is now almost obsolete. Dip candles were used till 1720, when molded candles were introduced into French theatres. The next improvement was the lamp of M. Argand, with its circular wick. In 1822 gas was first used in a Parisian theatre, next came the oxyhydrogen lime-light, used for special effects, and now electric lighting is rapidly superseding all other kinds.

The old way of producing lightning was to blow lycopodium or powdered resin with a bellows through a flame, and this is still used in realistic effects of conflagrations. More effective lightning is now made by flashing the electric light behind a scene painted with clouds in which a zigzag aperture has been cut out and filled with a transparent substance. Thunder is made by shaking large sheets of iron, by rolling cannon balls above the ceiling of the auditorium, and by clapping together a series of planks strung together on two ropes. Wind is imitated by a machine with a cogged cylinder, which revolves against coarse cloth tightly stretched. The sound of rain is produced by shaking parched pease in a metal cylinder.

The orchestra is now usually arranged either below or above the proscenium, so that the musicians are not visible. The prompter is placed at one side, in the wings, so as to avoid the disfigurement of the hood-like box which formerly used to cut the front line of the stage into two halves. This is, however, less convenient for the actors.

Till the middle of the present century little trouble or expense was laid out on dresses and accessories. Certain conventional costumes, made of cheap stuff, were used for

each part, with but little regard to historical correctness. Armor and weapons were made of pasteboard covered with metal foil, and stage jewelry was made of small cup-like pieces of tin formed with many facets. Now, however, no trouble or expense is spared to get the costumes and various properties archæologically correct; real jewels and the richest stuffs are often used for the dresses, as well as real furniture of the most costly sort for the furnishing of the scenic rooms. As much as \$100,000 is sometimes spent before the play can be presented. All this splendor and realism is very hostile to the true interests of the drama; magnificent scenery and the costly accessories are expected by the audience, rather than good acting. In some scenes, such as the procession in the first act of Richard III., as recently represented in New York, the words and acting of the chief performers were almost lost in the general bustle and splendor of the scene. Frequently, too, the noise involved in setting up some elaborate scene behind the stage almost drowns the voices of the actors in front of the drop scene.

The employment of female actors is of French origin, and dates from the first half of the 17th c.; but they were not permitted (without molestation) to tread the English stage till 1661. Before this innovation, female parts were performed by youths; and though it ill consorts with *our* ideas of adequate representation to conceive the parts of Desdemona, Ophelia, Cordelia, etc., executed by those of another sex, it would appear that several actors obtained a wonderful success in this line.

The title of "his majesty's servants," which English actors once bore, originated in the fact that some of them were really members of the royal household. The king and particular nobles kept troops of actors for their own pleasure, whom they sometimes permitted to go about the country and perform. The first prince we read of that gave his "servants" such permission, was Richard, duke of Gloucester (afterward Richard III.). In Queen Elizabeth's time (1571), the earl of Leicester's "servants" were licensed to open the first *public* theatre in England, and it is owing to the circumstance of actors having originally formed part of the household of the king that a license from the lord chamberlain is still necessary to the opening of a theatre.

Of American places of amusement, that with the largest seating capacity is the Madison Square Garden, New York, which seats, 6011 people, or with its main floor 11,000 people. The Mechanics' Hall, Boston, seats, 5500; the Auditorium, Chicago, 4041; The Boston Theatre, 3017; the Carnegie Music Hall, New York, 3000; the Metropolitan Opera House, New York, 2842; the Academy of Music, New York, 2700; the Music Hall, Boston, 2588; the Academy of Music, Philadelphia, the St. Charles Theatre, New Orleans, and Whalen's New Grand Metropolitan Theatre, St. Louis, 2500 each; the Chestnut Street Theatre, Philadelphia, and the New Olympic Theatre, St. Louis, 2400 each; Kernan's Monumental Theatre, Baltimore, and the Chicago Opera House, 2300 each; the Star Theatre, New York, 2243; the Columbia Theatre, Chicago, the Standard Theatre, Chicago, the French Opera House, New Orleans, and Niblo's Garden, New York, 2200 each; the Grand Opera House, Detroit, Dickson's Grand Opera House, Indianapolis, and the Columbia Theatre, San Francisco, 2100 each; Ford's Grand Opera House, Baltimore, Kelly's Front Street Theatre, Baltimore, the Globe Theatre, Boston, the Academy of Music, New Orleans, the Grand Opera House, New York, the Grand Opera House, St. Louis, the Standard Theatre, St. Louis, the Grand Opera House, San Francisco, and the Oakland Theatre, San Francisco, 2000 each. See Donaldson, *The Theatre of the Greeks* (8th ed., 1875); Malone, *History of the Stage*, (1820); Collin, *Annals of the Stage* (1879); Donnet, *Théâtres de Paris* (1821); Salomons, *Constructi des Théâtres* (1871); Constant, *Principaux Théâtres Modernes* (1870); Pougin, *Dictionnaire du Théâtre* (1884); Geary, *Law of Theatres and Music Halls* (1885); Seilhamer, *History of the American Theater* (3 vols., 1891). See DRAMA.

THEATINES, one of the more modern religious brotherhoods of the Roman Catholic church, which played a very important part in the well-known internal movement for reformation which took place in central and southern Italy toward the middle of the 16th c., and which Ranke has described in his *History of the Popes*. The founders of this association were a party of friends: Cajetan di Thiene; John Peter Caraffa, at that time bishop of *Theate* (from which the congregation took the name *Theatine*); Paul Consiglieri; and Bonifazio di Colle. Cajetan and Caraffa, in concert with the two other friends named above, having resigned all their preferments, obtained a brief of Clement, dated June 25, 1524, formally constituting the new brotherhood, with the three usual vows, and with the privilege of electing their superior, who was to hold office for three years. One peculiarity of their vow of poverty deserves special notice: they were forbidden to possess property, and were to subsist entirely upon the alms of the faithful; and yet they were strictly forbidden to beg, or in any way to solicit charitable contributions. Their first convent was opened in Rome, and F. Caraffa was chosen as the first superior. He was succeeded in 1527 by Cajetan, and the congregation began to extend to the provinces. After a time, however, it was thought advisable to unite it with the somewhat analogous order of the Somaschans; but this union was not of long continuance; Caraffa, who was elected pope, under the name of Paul IV., having restored the original constitution in 1555. By degrees, the Theatines extended themselves, first over Italy, and afterward into Spain, Poland, and Germany, especially Bavaria. They did not find an entrance into France till the following c., when a house was founded in Paris under cardinal Mazarin in 1644. To their activity, devotedness, and zeal, Ranke

ascribes much of the success of that remarkable reaction against Protestantism which took place in the latter half of the 16th century. In later times, however, they do not appear to have played any notable part. Their most remarkable member in modern times has been the celebrated Sicilian, Father Ventura, author of the well-known work *Bellezze della Fede*, and familiar to Englishmen by the part which he took in the Italian revolution of 1849. At present, the Theatine order is confined to Italy and Sicily.

THÉÂTRE LIBRE (Fr., free theatre). The name of an enterprise due to the energy and enthusiasm of a young Parisian, André Antoine, who on March 30th, 1887, opened a small theatre at Montmartre, which was to be conducted on the following original plan: The season consists of eight representations given only once a month from October to June; a different piece is produced at each representation; no tickets are sold to the public, but the spectators consist of the subscribers to the venture, and such persons as may be invited by the author or by M. Antoine; and the whole conduct of the affair is strictly private. The design is to give young authors a chance to try their strength; and also for art's sake, to produce plays, which for any reason, political or moral, might be forbidden by the censorship if undertaken at the public theatre. The Théâtre Libre has, in its way, been very successful. By 1890, thirty authors have been represented on its stage. Among them such famous writers as Zola, de Goncourt, Ibsen, Tolstoi, and Tourguéneff. Twenty-three of the new pieces so produced, have subsequently been given at the public theatres. With a few exceptions, the actors at the Théâtre Libre have been amateurs who receive a very small remuneration.

The idea of the Théâtre Libre has been copied in the Freie Bühne of Berlin, and both in London and Boston a movement to establish a similar house was begun in 1891. See on the subject George Moore's *Impressions and Opinions* (1891).

THEBAINE. See **OPIMUM**

THEBES, the name of a celebrated Egyptian city, called by the Egyptians Taape, or Taouab; by the Hebrews, No-Amen; by the Greeks, Thebæ; and at a later period, Diospolis Magna. It lies in the broadest section of the valley of the Nile, in about lat. 26° n., and was formerly the capital of Southern or Upper Egypt. Its ruins, the most extensive in that country, comprise nine townships, the most remarkable of which are Medinat Habu, Gournah, Karnak, and Luxor. Its local and eponymous god was Amen-Ra, or Jupiter Ammon; and its foundation traditionally dated from the time of Menes, the founder of the monarchy, although no remains of so early a date have been discovered on the site. Recently, however, excavations have brought to light constructions of the 11th dynasty, who appear to have founded the original temple of the god. The Nile flows through the midst of the ancient city, and divides it into four principal quarters: Karnak and Luxor, which lie on the e. bank, and Gournah and Medinat Habu, on the w. bank of the river. The most flourishing period of the city was under the 18th, 19th, and 20th dynasties, or from about 1500 to 1000 B.C., when it had supplanted Memphis, the ancient capital of the Pharaohs. The more central situation of this city probably caused it to rise into importance, for it was secure against the northern enemies of Egypt; hence, under these Diospolitan dynasties, the worship of Amen-Ra arose in all its splendor; magnificent palaces and temples were built in its different quarters, to which additions were made by later monarchs, and even by the Ptolemies and Romans till the time of the Antonines, in the 2d c. A.D. Here, too, were the cemeteries of the Theban monarchs and the officers of their courts, colleges of priests, and the seat of royal government. It was enriched by the spoils of Asia and the tributes of Ethiopia, and its fame and reputation had reached the early Greeks, Homer describing it by the epithet of Hekatompylos, or City of a Hundred Gates, in allusion to its propylæa, for Thebes was never a fortified city. In the plenitude of its power it sent forth an army of 20,000 war-chariots; but the Bubastite and Tanite dynasties removed the capital again to Sais and Memphis, and Thebes declined in importance, although retaining much of its ancient grandeur. At the Persian conquest, Cambyses obtained a spoil of nearly £2,000,000 from the city, destroyed many of its noblest monuments, and injured its political pre-eminence. The foundation of Alexandria by Alexander the great, and other causes, still further injured the city; and although some repairs were made under the subsequent monarchs, its grandeur had departed. At the time of Strabo. Thebes was only a cluster of small villages. When that geographer visited the city its extent was about 9½ m. in length (according to Diodorus), its circuit was about 16 miles. Its temples, tombs, and ruins were visited by the Roman travelers; and Germanicus and Hadrian inspected the sculptures of the temples. At a later period, a considerable Christian population existed under the empire; but the inhabitants fled at the Arab invasion to Esneh; and Thebes is now inhabited only by a few Arab families of Fellahéen, who obtain a precarious livelihood by guiding travelers over the ruins, or rifling the tombs for antiquities. At Gournah is to be seen the Memnoneion, built by Ramesses II.; with a colossus of that monarch, weighing 887½ tons, the largest statue in Egypt, broken. This is supposed to be the palace of Osymandyas, described by Hecateus, and is of considerable extent. In this quarter are two palace-temples of Amenophis III., and the vocal Memnon, or celebrated colossus of that monarch, supposed by the ancients to emit a sound at sunrise. At Medinat Habu is a pile of build-

ings, commenced by Thothmes I., of the 18th dynasty, with courts and propylæa, built by Ramesses III. or Rhampsinitus, and sculptures representing his victories over the Philistines, the life in his harem, the riches of his treasury, and a calendar with inscriptions dated in the twelfth year of his reign. Here, 8,000 ft. to the n.w., are the cemeteries of sacred apes; and 3,000 ft. beyond, the valley of the tombs of the queens, consisting of 17 *syringes*, or sepulchers, supposed to be the tombs of the Pallacides of Amen, mentioned by Diodorus and Strabo. Near them are the Biban-el-Meluk, or tombs of the monarchs of the 19th and 20th dynasties, 16 in number, the most interesting of which are that of Sethos I., called Belzoni's, after its discoverer, and those of Ramesses III., and Siptah. At Gournah itself are the tombs of functionaries and others, and this latter site has enriched the museums of Europe with antiquities of various kinds. The palaces of the Luxor quarter were founded by Amenophis III. From hence was removed the obelisk of the Place de la Concorde in Paris. Still more magnificent than any of these is the temple of Karnak, the sanctuary of which, built by Osertesen I. of the 12th dynasty, was added to by the monarchs of the 18th dynasty. The most remarkable part of this wonderful mass of courts, propylæa, and obelisks, is the great hall, 170 ft. by 329 ft., built by Sethos I. and Ramesses II., having a central avenue of 12 massive columns, 60 ft. high, 12 ft. in diameter; and 122 other columns, 49 ft. 9 in. high, 27 ft. 6 in. in circumference; and 2 obelisks, 92 ft. high, and 8 ft. square. In this temple is also the so-called portico of the Bubastites, built by Shishak I., recording his expedition against Jerusalem, 971 B.C. The Ptolemies also restored this building.—Diodorus, i. 45; Strabo, xvi. p. 816; Wilkinson, *Topography of Thebes* (8vo. Lond. 1835); Champollion, *L'Égypte*, i. p. 199, and foll.; *Lettres*, pp. 63–173; Belzoni, p. 58.

THEBES, the principal city of Beotia, in ancient Greece, was situated in the southern part of the country, on the slopes of Mount Teumessus, and between two streams, the Dirce and the Ismenus. According to the prevalent tradition, Thebes was founded by a colony of Phenicians under Cadmus (q.v.), after whom the city was called Cadmeia—a name subsequently restricted to the citadel; but passing over the long series of picturesque and tragic myths that have given it its pre-historic fame (in which the central figure is Œdipus), we first catch a quasi-authentic glimpse of Theban history in the 8th c. B.C., when one Philolaus, a Corinthian, settled in the place, and drew up a code of laws for the inhabitants. It is not till near the end of the 6th c. B.C., however, that we reach a purely historical period—the earliest well-attested event being the dispute between Thebes and another Beotian city, Plateæ, which involved the former city in an unsuccessful war with Athens. Henceforth, the relations of Thebes and Athens were, except for brief intervals, marked by bitter enmity. During the Persian war Thebes shamefully sided with the Asiatic invader, and, in consequence, lost much of her power and prestige. Athens proposed to deprive her of her supremacy over the Beotian confederacy; but Sparta, always jealous, even to spitefulness, of her Attic rival, interfered, and positively forced the other Beotian cities to acknowledge anew their unworthy mistress. When the Peloponnesian war broke out, Thebes took part with Sparta, and at its close, was eager for the destruction of Athens; but soon after it became jealous of the overgrown power of its ally, and gave a friendly welcome and shelter to those Athenians whom the oppression of the Thirty Tyrants (q.v.) compelled to abandon their city. It was from Thebes that Thrasybulus and his co-patriots started on their famous expedition for the deliverance of Athens, accompanied by a body of Theban citizens. A keen and bitter antagonism now sprung up between Thebes and Sparta, which, after many vicissitudes, ended in a great military struggle (379–362 B.C.), in which the former city, under the heroic guidance of Epaminondas (q.v.), achieved a brilliant triumph, and for a time held the position of the foremost power in Greece. It was now the time for Athens to revive her ancient animosities; and for a while they had free play. At length the eloquence of Demosthenes induced both states to unite in opposition to the encroachments of Philip of Macedon; but it was too late; and in 338 B.C. the battle of Chæroneia crushed the liberties of Greece. After Philip's death the Thebans made a fierce but unsuccessful effort to regain their freedom. Their city was taken by Alexander, who levelled it to the ground, and sold the entire population—men, women, and children—into slavery. For 20 years it remained an utter desolation; but in 315 B.C. it was rebuilt by Cassander, who gathered into it all the Thebans he could find in Greece. It was again destroyed by the Romans, and did not recover till about the decline of the empire. During the 11th and 12th centuries it was the seat of a considerable population engaged in the manufacture of silk; but under the Turks it again declined, though it has still a modern representative, Thebes, or Thiva, with a pop. of '89, 3228. Scarcely a single relic of antiquity has survived the ravages of time.

THECLA, a virgin saint of the early church, whose existence may be considered historical, although all, or almost all, the details regarding her are legendary, being in great measure founded upon an apocryphal book, now lost, entitled *The Periods (circuits) of Paul and Thecla*, the unhistorical character of which is declared by Tertullian (*De Bapt.* ii. 17), and by St. Jerome in his catalogue of ecclesiastical writers. According to the legend, Thecla was a member of a noble family of Iconium in Lycaonia, where she was converted by the preaching of St. Paul, and having devoted herself to a life of virginity,

suffered a series of persecutions from her intended bridegroom, as well as from her parents. As to the manner of her death, nothing is certain. She is styled in the Greek martyrologies the *proto-martyress*, as Stephen is the *proto-martyr*; while in the Roman breviary she is said to have died at the age of 90 in Seleucia, where her tomb was anciently pointed out. The *Acts of Paul and Thecla* was among the books stigmatized as "apocryphal" by Pope Gelasius.

THEFT. See LARCENY.

THE INE. See CAFFEINE and TEA.

THEINER, AUGUSTIN, 1804-74; b. Breslau, studied at Breslau and Halle; assisted his brother Johann Anton in a work on the history of celibacy; wrote an essay on the papal decretals which found great favor; visited Rome, 1831, became a member of the oratory of St. Philip Neri, fully identified himself with the ultramontane party, was consultant of the holy office. In 1848 he published a work opposing the election of bishops and priests by laymen, and maintaining the temporal sovereignty of the popes; was appointed in 1851 keeper of the secret archives of the Vatican, and published compilations illustrating the ecclesiastical history of the different Christian nations. His greatest work was the continuation of the *Annales Ecclesiastici* of Baronius in 1856. Having in 1869 corresponded with Dr. Döllinger and Prof. Friedrich, and advocated the Old Catholic doctrine and position, he was debarred access to the archives, but his salary was continued, and he remained in the Vatican.

THEISM, the doctrine concerning God, differing from pantheism by the relation which it affirms between God and the world of things; and from deism by the relation which it acknowledges between God and man. The pantheist asserts that God and the world are one; while the theist believes that a personal God, the creator of the world, is independent of it. The deist admits that God is the creator of the world, but denies that he has given a written revelation to man. Consequently, if man could exclude from his mind all the light which comes from revelation, his way would be dark indeed. But as the divine light shines around him, whether or not he acknowledge the source of it, his deism may become almost theism.

THEISS, the largest affluent of the Danube, and the second river of Hungary, rises by two streams, the Black Theiss and the White Theiss, in the Carpathian mountains, on the borders of Galicia. It flows first s. through a mountain-pass; but after receiving the Viso, Iza, Tarancz, and Talabor, it changes its course to w. and s.w., flowing past Tokay to Szolnok, where it curves toward the s.; and after running parallel to the Danube for upward of 300 m. it joins that river about 5 m. below the town of Titel. The principal towns upon its banks are Szigeth, Tokay, Szolnok, Csongrád, and Szegedin. About one half of this last town was destroyed by an inundation of the Theiss in the spring of 1879. Its chief affluents are—the Vörsova, Bodrog, and Hernad, the Szamos, Körös, Maros, and Bega, the most of which are navigable. The Theiss is navigable at Szegeth for small vessels, at Nemeny for steamers, and at Szolnok for large vessels.

THELLUSSON ACT is an act of parliament, 39 and 40 Geo. III. c. 98, passed for the purpose of checking the disposition of testators to accumulate the income of their estates until it should form a large fortune. The late Mr. Thellusson had, by his will, directed his personal property to be invested in land, and the rents and profits of the land to be so purchased, and of his other real estate, to be accumulated during the lives of all his descendants who should be living at the time of his death, or born in a certain time thereafter; and then he limited the accumulated property in favor of certain of his descendants who might be then living at that distant time. The property was said to have consisted of landed estates worth £4,000 a year, besides personalty of about half a million; and it was estimated that the accumulated fund would amount to above 19 millions. The testator's object was to create enormous wealth for the purpose of founding three families to spring from his three sons. For three quarters of a century the questions arising out of this will have been discussed in various forms; but the legislature, soon after the testator's death, took the earliest opportunity of preventing in future testators accumulating the income in this way for more than 21 years, and the above act was passed for that purpose. In the courts the first attempt to upset the will of Mr. Thellusson was to make out that it was too uncertain to be carried into execution—next, that the accumulation was illegal—next, whether males claiming through females would be entitled to a share: all of which attempts to upset the will failed. Ultimately, however, the fund proved not to be so large as was anticipated, and was distributed among a greater number of claimants. The eldest son was created Baron Rendlesham in 1806. The litigation ended by a decree of the house of lords in 1858. The Thellusson act has been extended to Scotland.

THEME, in music, one of the divisions of a subject in the development of the sonata-form; the *cantus firmus* on which counterpoint is built; the subject of a fugue; and a simple tune on which variations are developed.

THEMIS (Gr., "what is established by old law"), in Greek mythology, was the daughter of Uranus and Gæ (heaven and earth), the wife of Zeus, and, by him, mother of the Horæ (hours) and Moeræ (fates), as also of Eunomia (equity), Dikē (justice) and Eirēnē

(peace). She was regarded as the personification of order and justice, or of whatever is established by "use and wont;" and as such was charged by Zeus to convoke the gods, and preside over them when assembled, being likewise represented as reigning in the assemblies of men. In modern art Themis is represented as having her eyes bandaged, and at the same time holding a pair of evenly-balanced scales in one hand, with a sword in the other.

THEMISTOCLES, the great Athenian general and statesman, was the son of an obscure citizen of Athens, and was born about 514 B.C. He was actuated by excessive ambition from a very early period, and began his public career by setting himself in opposition to the principal men of the state, and chiefly Aristides, "the just." It is uncertain whether he was at Marathon, but there is no doubt that the laurels gained there by Miltiades fired Themistocles's ambition. From the time (483) that he got his inconveniently upright rival, Aristides (q.v.), ostracised, he was regarded as the political leader in Athens, being made archon eponymus in 481. In order to recover for Athens the naval supremacy in Greece, and that she might be prepared to meet the expected Persian invasion, he persuaded the Athenians to devote the proceeds arising from the silver mines at Laurium to the construction of a fleet, sagaciously foreseeing that his country's only chance of overcoming her enemy was by sea. In the battles of Artemisium and Salamis (480), disastrous for the Persians, Themistocles, commander of the Athenian fleet, the largest in Greece, to avoid dissensions, was content to serve under Eurybiades the Spartan. On both these occasions it was only by the greatest tact, combined with threats and a judicious outlay of the bribes which he himself had received in profusion, that Themistocles could induce the other commanders to come to an engagement with the Persians. On the night previous to Salamis he sent a faithful slave to tell Xerxes that, unless he came up next day, the Greek fleet would be scattered, and he would miss the chance of an engagement; thus securing either victory to the Greeks or the favor of Xerxes to himself in case of defeat. See SALAMIS. In several other ways did the wily Themistocles contrive to provide for himself a safe retreat at the Persian court in case of disaster. The victory at Salamis raised his reputation to the highest point. Not neglecting his own personal aggrandizement, he sailed round among the Grecian islands, and on various pretexts extorted enormous sums from the inhabitants. Shortly after the Persian invasion, his fellow-citizens began to see through him, and he was accused of bribery and extortion. In 471 he was ostracised and retired to Argos; and finally, to escape being tried for treason, in which he was implicated by the correspondence of Pausanias, he betook himself, in 465, to the court of Artaxerxes, king of Persia; but before he would see the king himself, got permission to wait a year, during which he made himself master of the language and usages of Persia. At the end of this time he managed to raise himself so highly in the king's favor that, after the Persian fashion, the town of Magnesia was appointed to supply him with bread, Lampasæus with wine, and Myus with other provisions. He lived securely at Magnesia until his death in 449. Some authorities assert that he poisoned himself. A monument was erected to Themistocles in the market-place of Magnesia, and it is said that his bones were secretly taken to Attica, and burned there. Undoubtedly Themistocles was a man of very great sagacity and determination, had a quick and keen perception of difficulties both present and future, which his ready invention, backed by promptness of action, enabled him to meet and overcome. On the other hand, he appears to have been possessed of no moral principles, his greatest ambition apparently having been to make himself, by fair means or foul, the greatest man in Greece.

THÉNARD, LOUIS JACQUES, Baron, 1777-1857; b. Nogent-sur-Seine; studied chemistry with Vauquelin in Paris; demonstrator of chemistry in the polytechnique school of Paris, 1797-1837, subsequently professor of chemistry in the college of France and in the university of Paris. The title of baron was given him in 1824; member of the academy, 1833; made peer of France in the same year. He resigned his chair in the university, 1840. With M. Gay-Lussac he published *Recherches Physico-chimiques*. In 1813 he began the publication of *Traité de Chimie Elementaire, Theorique et Pratique*, translated into German and French. He has given more time and money toward developing the scientific institutions of France than any one since Cuvier.

THE NARD'S BLUE. See BLUE.

THEOBALD, LEWIS, was the son of an attorney at Sittingbourne in Kent, at which place he was b. toward the close of the 17th century. His father's business, for which he was educated, proved not much to his mind; and betaking himself to literature, he published, in 1714, a tragedy entitled *Electra*, which he followed up by a number of other dramas. As a poet, he had scant success, and is long since utterly forgotten; but as the favorite butt of Pope, he is immortalized in the *Dunciad* of that writer. Besides this unenviable distinction, "piddling Theobald," as Pope contemptuously termed him, is not without some fair claim to be honorably remembered as one of the most laborious and useful of the early editors and commentators on Shakespeare. In this capacity, dull as he undoubtedly was, he did good service to the poet, which has since been sufficiently recognized. The hatred of Pope he incurred by a pamphlet published in 1726, entitled *Shakespeare Restored, or Specimens of Blunders committed or unamended in Pope's Edition of this Poet*; and if he could not compete with his adversary in wit, he proved

himself a much more complete editor of Shakespeare by his edition in 7 vols. 8vo, published in 1733, which quite extinguished that of his rival. His knowledge of our earlier drama was extensive and minute; and to his judicious application of it, in elucidating the text of the great poet, we remain to this hour not a little indebted. He died in Sept., 1774.

THEOBROMINE, $C_7H_8N_4O_2$, is a crystallizable principle present in chocolate. It is extracted from the cacao-nuts (the seeds of *theobroma cacao*) in the same manner as caffeine or theine is extracted from the coffee, tea, etc., in which that substance occurs. It is less soluble in water than caffeine, but resembles that substance in forming crystallizable salts with some of the acids. By dissolving theobromine in a solution of ammonia, and adding nitrate of silver, a gelatinous precipitate is obtained, which, by boiling with a solution of ammonia, yields a crystalline mass of theobromide of silver, $C_7H_7AgN_4O_2$, in which 1 equivalent of hydrogen is replaced by 1 of silver. This compound, when treated with iodide of methyl, yields iodide of silver and caffeine, which latter may be extracted with alcohol. Hence we arrive at the remarkable conclusion, that caffeine, $C_8H_{10}N_4O_2$, must be regarded as methyl-theobromine, $C_7H_7(CH_3)N_4O_2$.

THEOCRACY, literally, "government by God," is the name given to that constitution of a state in which the Almighty is regarded as the sole sovereign, and the laws of the realm as divine commands rather than human ordinances. Under such a view, the priesthood necessarily become the promulgators and interpreters of the "divine commands," and act as the officers of the invisible Ruler. The most famous example of a theocracy is that established by Moses among the Hebrews.

THEOCRITUS, the creator and most celebrated composer of bucolic poetry, was the son of Praxagoras and Philinna, and b. at Syracuse. The date of his birth is unknown, but the period of his greatest literary activity was probably 272 B.C. About the close of the reign of Ptolemy Soter, he visited Alexandria, where he received instruction, and made his first successful essays in poetry. He came to be patronized by Ptolemy Philadelphus, who assisted his father, Ptolemy Soter, in the government of Egypt; and in honor of his patron, he composed, about 285 B.C., his 14th, 15th, and 17th idyls. He further formed the acquaintance of the poet Aratus, to whom he addressed his 6th idyl. He subsequently revisited Syracuse, where he continued to reside under Hiero II. From his 16th idyl, it may be concluded that he was dissatisfied with the political state of Sicily, and also with the insufficient rewards which his poems received from Hiero; and that, in consequence, he fixed his attention, during his declining years, rather on the life of the country than of the court, and on those scenes of rural nature which form the chief subject of his poetical remains. The idyls of Theocritus are principally representations, dramatic and mimetic in their character, of the every-day life of the Sicilian peasantry. They have been successfully imitated by Virgil, and have given origin at least to that so-called pastoral literature of mediæval and modern times, which is, however, totally deficient in the simplicity, fidelity, and therefore poetry of the Syracusan author. Theocritus knows nothing of the imaginary shepherds of a fictitious Arcadia; his dramatic simplicity and truth are in wide contrast to the affected sentiment, the unnatural innocence, and the artificial simplicity of that unreal world. Comedy and pathos enter freely into his representations of rural Sicilian life, and his idyls retain the charms of freshness and nature even to the present day. They are 30 in number, though all of them are not strictly bucolic, or even genuine. They are written in a mixed dialect, in which the softened Doric prevails; and together with a few lines from a lost poem called *Berenice*, and 22 epigrams in the Greek anthology, make up his remains, of which the best editions are those of Meineke and Paley; and the best translations in English, those of Dr. M. J. Chapman; Calverly (1869); and Andrew Lang (1880).

THEODICY (Gr. *Theos*, God, and *diké*, justice; Lat. *Theodicia*, the judgment of God), a name given to the exposition of the theory of Divine Providence, with a view especially to the vindication of the attributes, and particularly of the sanctity and justice of God in establishing the present order of things, in which evil, moral as well as physical, so largely appears to prevail. The name is of modern origin, dating from the close of the 17th c., or the beginning of the 18th c.; but the theory itself, as well as the mysterious problem which it meant to resolve, is as old as philosophy itself. See EVIL. The first to consider the question in its integrity was the celebrated Leibnitz (q.v.). His work entitled *Essais de Theodicée sur la Bonté de Dieu, la Liberté de l'Homme, et l'Origine du Mal*, was published in 1710. It rose at once to the very highest point of popularity, and was translated into almost every European language. The leading principle of Leibnitz's vindication of God's goodness is the well-known optimistic theory which has been explained elsewhere (see OPTIMISM); but he had been followed by several writers in different countries—as Balguy, Werdermann, Kindervater, Creutzer, Benedict Kapp, and many others. Of these writers, it may be said in general, that they have followed the same method, and have addressed themselves to the same view—viz., the reconciliation with the goodness, the sanctity, and the justice of the one God, the existence of those manifold evils, physical or material, as well as moral, which appear in the present order of things. This view, it will be seen, is strictly limited to one single problem. But in the discussions of the new philosophic systems, and especially that of Hegel, which have arisen in Germany, new difficulties regarding the Christian idea of God have arisen out

of the rationalistic notions of existence in general. To meet those difficulties, a new theodicy has become necessary, and it has begun to occupy the attention of philosophers, especially in France. Two works in particular addressed to this view of the subject may be noticed; the first is M. Maret's *Christian Theodicee, or Comparison of the Christian and the Rationalistic idea of God*, 1845; the second is that of the Jesuit philosopher, Père Gratry, who has devoted the first volume of his course of philosophy, *De la Connaissance de Dieu*, to this special subject. This work was published at Paris, 1853.

THEODOLITE (Gr. *theoô*, I see, *dolichos*, long), an instrument much employed in land-surveying for the measurement of angles horizontal and vertical is neither more nor less than an altitude and azimuth instrument, proportioned and constructed so as to be conveniently portable. Like all instruments in very general use, the variations in its construction are almost numberless; but its main characteristics continue unaltered in all forms. It consists essentially of two concentric circular plates of copper, brass, or other material (the upper plate, or *upper horizontal*, either being smaller, and let into the lower, or *lower horizontal*, or the rim of the lower raised round the outside of the upper), moving round a common axis, which, being double, admits of one plate moving independently of the other. Upon the upper horizontal rise two supports, bearing a cross bar, which is the axis of a *vertical circle* moving in a plane at right angles to the former. This latter circle either has a telescope fixed concentric with itself, or a semicircle is substituted for the circle, and the telescope is laid above, and parallel to its diameter. The circles, as their names denote, are employed in the measurement of horizontal and vertical angles. For these purposes the outer of the horizontal circles is graduated, and the inner carries the index-point and the verniers (q.v.); the vertical circle is also graduated, and the graduations are generally read off by an index-point and vernier firmly attached to the supports. The upper horizontal is furnished with two levels placed at right angles to each other, for purposes of adjustment, and has a compass-box let into it at its center. The stand consists of a circular plate supported on three legs, and connected with the lower horizontal by means of a ball-and-socket joint; the horizontal adjustment of the instrument being effected by means of three or four (the latter number is the better) upright screws placed at equal distances between the plates. The telescope is so fixed as to be reversible, and the adjustments are in great part similar to those of other telescopic instruments, but are too numerous and minute to be here detailed. Both horizontal plates being made, by means of the screws and levels, truly level, the telescope is pointed at one object, and the horizontal angles read off; it is then turned to another object, and the readings-off from the graduated circle again performed; and by the difference of the readings, the angular horizontal deviation is given; and when vertical angles are required, the readings are taken from the vertical circle in a similar manner.

THEODORA, Empress, 508-548; b. Cyprus; a dancer and courtesan at Constantinople, to whom Justinian was married in 525. He proclaimed her empress on his accession to the throne in 527, and she seems to have exerted considerable influence in public affairs. The legislation of Justinian for improvement of the stage was, no doubt, due to her. By that legislation any actor becoming a Christian could not be obliged to remain upon the stage if he had conscientious scruples against doing so.

THEODORE, King of Abyssinia. See **ABYSSINIA**.

THEODORE, of Mopsuestia, a well-known writer of the Syrian church, and especially notable in connection with the controversy of "The Three Chapters," was born of a wealthy and distinguished family at Antioch, in the first half of the 4th century. He was the school-fellow and friend of St. John Chrysostom, and his fellow-pupil under the philosopher and rhetorician Libanius; and he was induced by the earnest exhortation of Chrysostom, to join with him in embracing the monastic life. His theological and scriptural studies were made under Flavian of Antioch and Diodorus of Tarsus; and having received priest's orders, he resided for a time at Antioch, where his learning and eloquence won the highest applause; and afterward at Tarsus, under his old teacher Diodorus. About the year 390, or a little later, he was chosen bishop of Mopsuestia in Cilicia. In 394 he preached in the presence of the emperor Theodosius at Constantinople, on occasion of a synod held in that city. Of his further history little is known; but his literary activity must have been prodigious, if we can judge by the contemporary accounts, and by the number of the works which are ascribed to him, but of which only fragments now remain. The most important of these consisted of commentaries on almost all the books of Scripture, and various polemical writings. A supposed tendency to Pelagian and Nestorian errors was observable in Theodore, and was in part the occasion of the long controversy of the three chapters. This controversy, however, did not arise till long after the death of Theodore, which took place about 427. Considerable fragments of Theodore's commentaries have been published by cardinal Mai in his *Spicilegium Romanum*, and some of his works still exist in Syriac; but by far the greater proportion has been lost.

THEODORETUS (Gr. *Theodoretos*, God-bestowed), a celebrated church historian and theological writer, was born at Antioch about the year 393, and received his name from the circumstance of his being supposed to have been granted as the fruit of earnest prayer, to his parents, who had long been childless. He was educated from early childhood in a monastery, where, among his fellow pupils, were Nestorius and John of

Antioch, both afterwards celebrated in the controversy which takes its name from the former. He was admitted among the clergy of Antioch; and at a comparatively early age became bishop of Cyrus, a city of Syria. His zeal and eloquence were the theme of universal praise, and his success in bringing unbelievers and heretics to the church was almost unprecedented. In the controversies on the subject of Nestorius and his doctrines, which followed the condemnation pronounced by the council of Ephesus in 431, Theodoretus for a time took a warm and active interest. The party of Nestorius was with difficulty brought to an accommodation with Cyril of Alexandria, in virtue of which the condemnation of Nestorius by the council was acquiesced in by John, bishop of Antioch. For a time Theodoretus dissented from this condemnation of Nestorius; and he not only expressed these sentiments in a letter addressed to Nestorius himself, but also wrote formally against the celebrated anathemas of Cyril directed against Nestorianism. But he afterward saw the necessity of yielding, and concurred in the deposition of those bishops who still persisted in their rejection of the council of Ephesus. Nevertheless, he by no means fully accepted the views of Cyril; and when, on Cyril's death, the opposition to Nestorianism began to develop, under the turbulent partisanship of his successor in the see of Alexandria, Dioscorus, into the contrary error of Eutychianism. Theodoretus endeavored to induce Dioscorus to abandon his extreme opinions. Failing in the attempt, Theodoretus composed the work which has often figured in modern controversy, on account of the well-known passage as to the change of the eucharistic elements which it contains, entitled "*Eranistes or the Many-shaped*." This work was regarded by Dioscorus as a renewal of the Nestorian error, and he accused Theodoretus to Domnus, the new patriarch of Antioch, of that heresy. Theodoretus replied with great moderation; but Dioscorus persisted; and having engaged the imperial court on his side, succeeded in obtaining from the emperor Theodosius II. an order confining Theodoretus within the limits of his own diocese. Meanwhile, the Eutychian controversy reached its height, and Eutyches (q.v.) having been first condemned by Flavian, bishop of Constantinople, in a synod held in 448, was afterward absolved in the celebrated robber-council of Ephesus, under Dioscorus in 449. The latter council not only excluded Theodoretus from its sittings, but formally deposed him from his see; whereupon he was compelled to retire to the monastery at Antioch in which he had received his first education. All this, however, was reversed by the general council of Chalcedon, in 451. Theodoretus did not very long survive his restoration. He died about the year 457. His works fill four volumes folio, reprinted in 10 parts 8vo, by Schulze (Halle, 1768-74), and consist of commentaries on many books of the Old Testament and the whole of St. Paul's Epistles; a *History of the Church*, from 325 to 429 A.D., in five books; *Religious History*, being the lives of the so-called fathers of the desert, a series of most curious and interesting pictures of early ascetic life, etc., the *Eranistes*, a dialogue against Eutychianism; *A Concise History of Heresies*, together with orations and a large number of letters.

THEODORIC, surnamed **THE GREAT**, the founder of the Ostrogothic monarchy, which comprised Italy, Sicily, south-eastern Gaul, Rhetia, Noricum, Pannonia, and Dalmatia, was born on the banks of the Neusiedler See, to the s. of Vienna, in 454 A.D. His father, Theodemir, was one of the three brothers (the other two were Walamir and Widimir) who, on the death of Attila (453 A.D.), freed their nation from the yoke of the Huns, and being the representatives of the royal line of the Amali, exercised a united sovereignty over it; but the death of Walamir, and the departure to Italy and Gaul of Widimir with a part of the nation, left Theodoric's father sole ruler of the Ostrogoths who remained in Pannonia. Previous to these events, Theodoric had been given as a hostage to the eastern emperor, in accordance with whose directions he had been accustomed to all kinds of athletic and martial exercises, so that after his return (473) home, he was well qualified to fill the post of ruler of his ferocious and valiant kinsmen, which, by the death of his father, was left vacant in 474. In the previous year, the Ostrogoths had obtained parts of Mesia and Dacia as settlements from the emperor Zeno, and for years they gallantly defended the empire from foreign aggressors, other Gothic tribes included; but the impolitic faithlessness of Zeno produced in revenge the devastation of Thessaly and Macedonia, and subsequently (487) a raid directed on the capital itself. The emperor, to free himself from his troublesome ally, gave him permission to invade Italy, a suggestion gladly adopted by the warlike monarch, who started for Italy in 488; and after forcing his way through the Gepidæ and others who attempted to bar his progress, and gathering recruits on the way, arrived in the summer of 489 on the frontiers of Italy. Odoacer was both forewarned and forearmed; and a desperate conflict between the two powerful armies took place near Aquileia (August 28, 489), distinctly to the advantage of the Ostrogoths. A second and more disastrous defeat was inflicted on Odoacer near Verona (Sept. 27), after which he took refuge in Ravenna; but having again gathered a large force, he was totally routed a third time on the banks of the Adda (August, 490), again blockaded in Ravenna, while the whole of Italy was being subdued; and having at last surrendered, was treacherously murdered (March, 493). Theodoric now assumed the title of *king of Italy*, resisted the claim of suzerainty preferred by the eastern emperor; and with the exception of a victorious campaign against the Franks, to compel them to cease their assaults on the Visigothic dominions, the suppression of a rebellion in Spain against the authority of the

infant monarch, his own grandson Amalric (during whose minority Theodoric administered also the government of the Visigothic kingdom), and an expedition against the robber hordes of the Bulgarians, the whole of his long reign was devoted to the consolidation and development of his new kingdom. His followers only received one-third of the conquered country; the rest was legally secured to the then possessors, and by degrees his barbarous followers were placed upon a footing of harmony with their fellow-subjects. Theodoric made Ravenna his capital; occasionally, when his northern frontier was threatened, removing to Verona. He died in 526. Theodoric holds the very highest rank among monarchs. An uneducated barbarian, and master of a power which even the most formidable of his neighbors, the Franks, could not have long withstood, he showed no desire of conquest; cultivated the friendship and esteem of the surrounding nations; ruled all classes of his subjects with irresistible authority, but with corresponding justice and moderation; zealously promoted agriculture and commerce till Italy again took its old position as the most prosperous country in Europe; and, himself an Arian, exhibited a tolerance of all other sects, which the latter, when their turn for supremacy came, were very far from imitating. The foul blot on his character is the judicial murder of Boëthius (q.v.) and Symmachus, for a supposed connivance with the senator Albinus to restore the authority of the eastern emperor in Italy; but every fact that can be gathered respecting this event bears out the belief that it was the result of a burst of passion, intensified by his extreme, nay, almost morbid, jealousy of Byzantine interference in Italy. The one great error of his administration consisted in his wholly neglecting to assimilate his Ostrogothic subjects with the previous inhabitants, either by a common code of laws, or by common official preferment; for though, under his sway, the evil of this separation did not appear, yet, when the scepter fell to weaker hands, an antagonism necessarily arose between the ruling and the subject races, which was the chief cause of the successful restoration of Byzantine authority in Italy by Belisarius (q.v.) and Narses (q.v.). Theodoric left no son; but his third daughter, Amalaswintha, succeeded him as regent for her son Athalaric; the eldest, Theodiscusa, having become queen of the Visigoths, and the mother of Amalric; and the second, Ostrogotha, the wife of Sigismund, the last king of the Burgundians.

THEODOSIUS, the name of three later Roman emperors.—**THEODOSIUS I.**, surnamed **THE GREAT**, and **THE ELDER**, to distinguish him from his grandson, was of Spanish descent, and was born either at Italica (as Gibbon and those who wish to make him of kin with Trajan maintain), or more probably at Cauca, near Segovia, about 346 A.D. His father, also named Theodosius, was the great general of the Roman empire, who, after freeing South Britain from the savage Caledonians, who roamed over it at their pleasure, and annihilating the formidable rebellion of the Moor Firmus, which threatened to divorce the African provinces from the empire, was conspired against by his many malicious enemies at court, and summarily beheaded at Carthage in 376. Theodosius, who had accompanied his father in his British campaigns, and afterward, by routing the Sarmatians, saved Mesia from devastation, retired from active service after his father's murder, and occupied himself with the care of his patrimonial lands in Spain. But his many virtues and talents were not forgotten at court; and on the defeat and death of Valens (q.v.), his colleague, Gratianus (q.v.), feeling his inability to sustain alone the cares of empire, summoned Theodosius from his retirement, invested him with the imperial purple, and confided to him, Jan. 19, 379, the administration of Thrace, Dacia, Macedonia, Egypt, and the east, and especially the protection of the empire against the Goths. This last charge called for the full exercise of the new emperor's abilities, for the army at his command dared not face the Goths in the open field; and even when, after the death of their able leader, Fritigern, the Ostrogoths and Visigoths separated, each breaking up into several bands, Theodosius found it most prudent to sow jealousy and dissension among them by promises and bribes, and after a four years' so-called campaign, succeeded in pacifying the Visigoths, the Ostrogoths retreating toward Scythia. The latter returned in 386, their ranks swelled by Scythians, but were totally routed in attempting to pass the Danube, and the survivors were transported to Phrygia and Lydia. In 387, Theodosius undertook to restore to the throne of the western empire Valentinian II. (whose sister, Galla, he married), the brother of Gratian, who had been expelled by Maximus; and after a uniformly successful contest, the usurper was captured and put to death at Aquileia. In 392, the suspicious death of Valentinian, and the elevation of the puppet Eugenius by Arbogastes, the real ruler of the west, again summoned Theodosius to interfere; and after two years of preparation, his motley army of Byzantines, Goths, Alans, and Huns, aided by the treachery of some of Eugenius's generals, gained a complete victory over the Gauls and Germans, who chiefly constituted the army of the west; and the two portions of the Roman empire were again united under one ruler. The union, however, lasted only four months, owing to the death of Theodosius, Jan. 17, 395. Theodosius, though a professor of the orthodox Christian faith, was not baptized till 380, and his behavior after that period stamps him as one of the most cruel and vindictive persecutors who ever wore the purple. His arbitrary establishment of the Nicene faith over the whole empire, the deprivation of civil rights of all apostates from Christianity and of the Eunomians, the sentence of death on the

Manicheans and Quarto-decimans (q.v.), all prove this; though the want of evidence for the direct execution of these severe laws, somewhat modifies the unfavorable impression they produce, and inclines us to believe, that, like the massacre at Thessalonica, they were the result of a sudden access of savage passion, carefully fanned by his interested ecclesiastical advisers. His humiliation before St. Ambrose, bishop of Milan, for the massacre at Thessalonica, was regarded by the church as one of its greatest victories over the temporal power. See AMBROSE.—THEODOSIUS II., surnamed THE YOUNGER, the only son and successor of Arcadius (q.v.), was born 401 A.D., succeeded his father when eight years old, and occupied the throne of the east for 42 years. The chief events of his reign were the invasion of the empire by the Huns under Attila, a war with Persia, renewed efforts to extirpate paganism, and the compilation of the *Codex Theodosianus* (see CODE). The emperor himself was the feeblest of rulers, and was much better adapted for the cowl than for the scepter and sword.

THEOGNIS, an elegiac poet of Greece, about 544 B.C. Plato and Suidas say that he was a native of Megara in Sicily, others, and with probability, think he was born in Megara in Greece. In a conflict at Megara between the aristocracy and the democracy, the later prevailed, and Theognis, who belonged to the former, lost his landed property and was banished with his wife Argyris; they found refuge in Thebes. It is not known where he died. He left a work consisting of a series of moral sentences in elegiac verse, and containing many striking sentiments.

THEOGONY, the name given in ancient Greece to a class of poems recounting the genealogy of the gods. Musæus (q.v.) is said to have written the earliest theogony; but his work, as well as the theogonies of Orpheus (q.v.) and others, have perished; that of Hesiod (q.v.) being the only one that has come down to us.

THEOLOGY (Gr. *theologia*, lit., a speaking or writing about God) is a term employed to denote the theory of the divine nature and operation. It first occurs in Plato and Aristotle, who understand by it the doctrine of the Greek gods, and of their relation to the world. Homer, Hesiod, Orpheus, etc., are called *theologoi* (theologians), on account of the subject-matter of their verse. But their theology is at the same time called "mythic," to distinguish it from the "physical" theology of the philosophers, which, reversing the mythic order, concerned itself with speculative inquiries regarding the origin of the world and its relation to the gods. In the New Testament, the word theology does not occur, and the idea seems alien to the simplicity of the primitive Christian faith. The Greek Christians originally designated any deep philosophical apprehension of the truths of religion by the term *gnosis* (knowledge), which was opposed to *pistis* (faith), the simple irreflective trust of the majority of humble believers. First during the 3d and 4th centuries the word theology came into use, especially in connection with such of the fathers as defended the doctrine of the deity of the logos. In this sense, the evangelist John and Gregory of Nazianzen were termed *theologians*. During the same period, the word theology was applied to the doctrine of the Trinity. In the century following, its application was widened by Theodoret, who used it to denote the whole circle of theoretical instruction in religion; and finally, Abelard, through his *Theologia Christiana*, gave the word that comprehensive signification it still bears, as expressive not only of a theoretical but also a practical exposition of religious truth. The word divinity is sometimes used to denote the same thing as theology.

THEOPHILUS, one of the most important precursors of Dr. Faust, was, according to the legend, coadjutor-bishop at Adana, in Cilicia. After the death of his bishop, being unanimously chosen successor, he declined the proffered honor, but was shortly afterward, at the instigation of slanderers, deposed from his former office by the new bishop. He now had recourse to a Jew magician, who took him to a midnight meeting of devils, whose chief ordered him to deny Christ and Mary, and to give a bond making over his soul. The result was that next morning he was re-instated in his office and dignities by the bishop; and now, presuming on the support of his confederates, he began to assume a supercilious and domineering manner. But he was soon overtaken with remorse, and, through 40 days' fasting and prayers, prevailed on Mary to intercede with her son for him, and to get back the letter from the devil, which she laid upon the breast of the repentant sinner, as he lay asleep in the church. Theophilus then made a public confession of his crime, told of the goodness of the Virgin Mary, and died three days after. This legend, whose origin is traced back to an unknown Greek, of the name of Euty-chianus, was brought, during the 10th c., through an equally unknown Neapolitan priest, named Paulus, to the west, where it very quickly spread far and wide. Before the end of the century it was put into Latin verse by Roswitha, and still better, by the bishop of Rennes, who died in 1123 (printed in the *Acta Sanctorum*, Feb. 4, and in *Hildeberti Tironensis et Marbodi Opera*, published by Beaugendre, Par. 1708). Gauthier de Coinsy (died after 1236) turned it into a beautiful French poem (printed in *Œuvres de Rutebeuf*, published by Jubinal, 2 vols.); and the Rhenish compiler of the *Alte Passional* admitted it among his legends of Mary (*Marienlegenden*, published by Pfeiffer, Stuttg. 1846). A Dutch metrical version, in the 14th c., was published by Blommaert (*Theophilus*, Ghent, 1836). The first dramatic handling of the subject was in French by Rutebeuf, a distinguished troubadour of the 13th c. (*Œuvres*, published by Jubinal, 2 vols., Par. 1839); then repeatedly during the 14th and 15th c. in Low-German (*Roman-*

tische und andere Gedichte in altplattdeutscher Sprache, published by Bruns, Berl. and Stettin, 1798; *Theophilus, in Icelandic, Low-German, and other Tongues*, by Dasent, Lond. 1845). The legend of Theophilus is also not seldom to be found inserted in large works, and frequent allusions to it occur in Latin, German, Anglo-Saxon, Icelandic, Swedish, French, and even Spanish literature. It has even been pictorially represented in French churches. With the 16th c. it seems to have disappeared. However much the various versions differ from one another in the minor circumstances, the essential traits remain throughout unchanged; that Theophilus made a compact with the devil in order to recover lost property; that he attained his object, but at the same time nothing more (nothing whatever of magic art), and that Mary rescued the repentant sinner. Through this legend of Theophilus, the oldest known instance of a compact with the devil, there runs a lenient spirit (derived from paganism, and which the Roman Catholic church was able to sanction by interposing the Virgin Mary), which distinguishes it markedly and essentially from the stern Protestant shape of the devil's compact in the Faust-book, which, with vigorous consistency, requires the consignment of the contracting party to hell.

THEOPHRASTUS, the Greek moralist and naturalist, was born at Eresus in Lesbos, and studied philosophy at Athens, first under Plato, and subsequently under Aristotle. The latter took especial interest in him, and according to a rather incredible legend, altered his original name of Tyrtamus into that of Theophrastus (divine speaker), in compliment to the fluent and graceful speech of his pupil. To Theophrastus, moreover, he bequeathed the presidency of the lyceum, his library, and the original MSS. of his writings. Theophrastus proved a worthy successor of the Stagirite. Under his presidency the lyceum sustained its character, and attracted no fewer than 2,000 disciples, among whom was the comic poet Menander. The kings Philipppus, Cassander, and Ptolemy held him in high esteem; and such was the admiration of the people of Athens for him that, when he was arraigned for impiety and triumphantly acquitted, they would have killed his accuser had he not generously interceded. In compliance, however, with the law of Sophocles, which decreed the banishment of all philosophers from Athens, Theophrastus, in 305 B.C., left the city, until the enactment was repealed the very next year by Philo, also a disciple of Aristotle. From that date Theophrastus continued his lectures until his death in 287, at which time he had presided over the academy for 35 years. His birth being unknown, we are ignorant of his age at the time of his death, and conjectures variously give it from 85 to 107 years. On the eve of dissolution, he is said to have complained of the shortness of human life, which ended just when he was about to solve its enigmas. He was accompanied to the grave by the entire Athenian population. He bequeathed his library to Neleus of Scepsis. The great object of his philosophical labors was to develop the Aristotelian system, to explain the difficulties which obscured it, and to fill up the gaps which left it incomplete. Most of the works which he wrote with this object have perished; only the following remain: 1. *Characteres*, in 30 chapters, descriptive of vicious character; 2. *Of Sensuous Perception and its Objects*; 3. A fragment on *Metaphysics*; 4. *Of the History of Plants*, in 10 books, one of the earliest of extant treatises on botany; 5. *Of the Causes of Plants*, in 8 books, of which, however, only 6 remain; 6. *Of Stones*. The best complete edition of Theophrastus is that of Schneider; there are numerous editions of the *Characteres* separately.

THEOPHYLACT, b. Constantinople; was made archbishop of Bulgaria in 1078, and resided at Achrida. He wrote a work on *Education of Princes* for the benefit of his pupil, Constantinus Porphyrogenitus, the son of Michael VII. and the empress Maria. He wrote valuable commentaries on the 12 minor prophets, and on the greater part of the New Testament, compiled chiefly from the works of Chrysostom. He wrote also 75 epistles and several tracts. His works were printed in Greek and Latin at Venice, 4 vols. folio.

THEORY, a word expressing the scientific process of generalization under various aspects.

Theory is, in the first place, opposed to fact, or matter of fact, and signifies that a certain class of facts have been generalized and brought into a single comprehensive statement. It thus corresponds to a principle, general truth, or law of nature. That a half-inflated bladder hung before the fire is expanded till it bursts is a matter of fact; that bodies generally are expanded by heat is the theory or general principle, comprehending the whole class of facts. To give the theory of a fact in this sense of the word is to give its general law; this is also called its explanation, and sometimes its cause. See CAUSE.

Theory, in the next place, is opposed to hypothesis (q. v.). A fact may for a time be referred to a hypothetical or assumed principle; endeavors being meanwhile made to remove the hypothetical character by proving or disproving the principle. The vortices of Descartes was a hypothesis to account for planetary motions; while Newton's view, that gravity might be the cause of these motions, was in the first instance a hypothesis. The Cartesian doctrine was disproved and abandoned; the Newtonian was fully verified, and, ceasing to be a hypothesis, became a theory.

Lastly, theory is opposed to practice. The theory of a subject is the knowledge or explanation of it; the practice is making some use of it. Physiology is theory; physic.

or medicine, is practice. In practical matters there are two modes of procedure which are still further illustrative of the distinction now in hand. The knowledge possessed by a worker in any art may be empirical, experimental, rule-of-thumb—that is, it may be gathered by actual experience in the particular operation. The seaman's knowledge of the prognostics of weather, and the cook's art in boiling and roasting, are usually of this kind. On the other hand the worker's knowledge may be obtained from theory, in other words, from general principles or laws scientifically ascertained; as when the theory of the winds and the law of storms are employed to predict the weather; when the cook roasts and boils according to the known temperature for coagulating albumen; and when a physician prescribes a dietary grounded on a chemical analysis of the food and of the tissues to be maintained. Great caution is required in the employment of such theoretical knowledge in the arts and in practical affairs. It is not enough that the theories are fully established; we must also know all the conditions of the case, so as to allow for every agent operating to produce or to mar the effect. That a cannon-ball should describe a parabola, is a correct theoretical inference from gravity and the laws of motion; but the resistance of the air, a distinct agency, makes it untrue in fact, and therefore misguiding in practice. When this resistance is allowed for, the theory is complete, and its application will no longer disappoint the operator. See DEDUCTION.

THEOSOPHY (Gr. *theosophia*, divine wisdom), the name given to a so-called sacred science, which holds a place distinct as well from that of philosophy as from that of theology, even in questions where these latter sciences have the same object with it, namely, the nature and attributes of God. In investigating the divine nature and attributes, philosophy proceeds entirely by the dialectic method, employing as the basis of its investigation the ideas derived from natural reason; theology, still employing the same method, superadds to the principles of natural reason those derived from authority and revelation. Theosophy, on the contrary, professes to exclude all dialectical process, and to derive its knowledge of God from direct and immediate intuition and contemplation, or from the immediate communications of God himself. Theosophy, therefore, so far as regards the science of God, is but another name for mysticism (q.v.), although the latter name implies much more; and the direct and immediate knowledge or intuition of God, to which the Mystics laid claim, was, in fact, the foundation of that intimate union with God, and consequent abstraction from outer things, which they made the basis of their moral and ascetical system. The theosophic system dates from a very high antiquity; and within the Christian period we may number among theosophs, the Neo-Platonists, especially Plotinus, Iamblichus, and Proclus; the Hesychasts of the Greek church; all those of the mediæval Mystics who laid claim to any dogmatical theory; and in later times, the Paracelsists, Bodenstein and Thalhauser, Weizel, Jacob Böhme, and above all, Emmanuel Swedenborg. If we consider one particular view of the philosophic system of Schelling, he also may be assigned to this school. See OCCULTISM.

THERA, or SANTORIN, an island on the w. coast of Greece, the most celebrated of the Sporades, in the Grecian archipelago; 41 sq. m.; pop. '89, 22,000. According to Strabo it was 700 stadia n.e. from the Cretan coast, and 200 stadia in circumference. Its origin, given by mythology, is a clod of earth thrown from the ship *Argo*; another legend was that it was produced by submarine fires. Between this island and smaller islands of the group is the crater of an ancient volcano. By an earthquake, 237 B.C., the land now forming the little island of Therasia was torn off, giving it the shape of a horse-shoe. The formation of the coast makes an excellent harbor, which, however, has no bottom reachable by anchors, and vessels tie up to the shore. In 1866-70, a new volcano broke out, with a cone which attained the height of 325 feet. The portion which in ancient times was covered with lava, ashes, and pumice-stone, is now a cultivable surface, producing barley, wine, and cotton, which does not require planting every year. It contains an extensive ledge of fine marble which has been undisturbed by volcano or earthquake. The principal industry is shipbuilding, and the inhabitants are Greeks.

THERAMENES, d. B.C. 404; b. Greece. In 410 he was at the battle of Cyzicus and in 408 at the siege of Chalcedon and the capture of Byzantium. He was one of the generals at Arginusæ in 406, and succeeded in saving the lives of the 6 generals condemned for not rescuing the drowning crews. He went on an embassy to Lacedæmon during the siege of Athens by Lysander, and finally, after passing three months with the latter, made peace in behalf of the Athenians. He had an understanding with the exiles of the Athenian oligarchy, and was one of the 30 tyrants. He was put to death by the partisans of Critias, whose measures he had opposed.

THERAPEUTÆ, a pious "Jewish" sect, mentioned in a book ascribed to Philo, as living chiefly on the lake Mareotis, near Alexandria, but as having also numerous colonies in other parts of the world. They are described as in many respects like the Essenes (q.v.). Like them, they lived unmarried in a kind of monastery, were very moderate with regard to food and dress, the latter consisting in a white garment; prayed at sunrise, their face turned to the sun; studied much in the Scriptures—which they explained allegorically—and in other "ancient books," and were principally opposed to slavery. The chief differences between these two "sects," as they are described to us, consisted in the Therapeutæ simply living a life of contemplation, while the Essenes fol-

lowed many occupations, such as agriculture, arts, etc.; the latter lived together, while the Therapeutæ lived separately in their cells; the Essenes not only took an interest in other human beings, but actively assisted them; while the Therapeutæ, who also, before they entered the brotherhood, divided their property among their relatives, contrary to the "common treasure" of the Essenes, kept in utter ignorance of the outer world. Again, the Therapeutæ knew none of the divisions which marked the degrees of initiation among the Essenes, but they held the temple at Jerusalem in much higher veneration than the latter; the Therapeutæ brought up boys to the brotherhood, while the Essenes only recruited themselves from grown-up people. One of the chief characteristics of the Therapeutæ was also the religious meals they used to hold in common on every seventh Sabbath; the Essenes having two such sacred meals daily. Many and striking are also the analogies offered by their mode of life and their doctrines to those of the Pythagoreans. Neither partook, e.g., of animal food or wine, and both admitted women to their assemblies, which were mostly concluded with hymns; and they both held the number seven sacred. Many theories have been broached in regard to this mysterious sect. One of the most plausible notions is the one—latterly much discussed—of the whole book *De Vita Contemplativa*, which treats of this sect, being falsely attributed to Philo. It is rather believed to be the work of an early Christian, intended to idealize the life of Christian monasticism and asceticism of the first centuries. See **ESSENES**.

THERAPEUTICS (Gr. *therapeuo*, I heal) is that division of the science of medicine which treats of the various actions of remedies upon the diseased animal system, or the means by which nature may be aided in her return to health.

THERESA, SAINT. See **TERESA**.

THERESIOPEL, more commonly called **MARIA-THERESIOPEL** (Hung. *Szabadka*), an important town in the *Bácska*, the richest corn district of Hungary, 24 m. w.s.w. of Szegedin, near the Palitsch lake. It contains numerous important buildings, as the churches, gymnasium, and the great barracks. Manufactures of leather and shoes, linen-weaving, dyeing, the production of wine, tobacco, and fruits, together with the rearing of cattle and horses, are the chief branches of industry. Pop. '90, 72,737.

THERIACA (Gr. *ther*, a-wild or a venomous animal), a medicine in the form of an electuary, supposed to be an antidote to the poison of venomous animals. It was invented by Andromachus of Crete, physician to the emperor Nero, and was described in a poem, preserved in Galen's work, *De Antidotis*. This theriac was a mixture of about 70 ingredients, some of them quite inert, and others antagonistic to one another. Yet it continued in repute until recent times, and it is not long since in Venice, Holland, France, and other places, the druggists had to prepare the compound with certain solemnities in the presence of the magistrates. The term theriac was applied to various compounds of a similar nature, and *theriac* and *theriacal* became synonymous with medicinal. The English word *treacle* is a corruption of *theriacal*, and originally meant an electuary, or compound syrupy medicine (e.g., Venice treacle=the theriac of Andromachus); and it was applied to molasses from the similarity in appearance.

THERMIDOR, i.e., the "hot month," formed, in the calendar of the first French republic, the 11th month, and lasted from July 19 to Aug. 18. The 9th Thermidor of the Republican year 2 (July 27, 1794) is historically memorable as the date of Robespierre's fall, and the termination of the Reign of Terror. The name Thermidorians was given to all those who took part in this fortunate *coup d'état*, but more particularly to those who were desirous of restoring the monarchy.—See Duval's *Souvenirs Thermidoriens* (2 vols., Par. 1844.)

THERMO-BAROMETER. A name applied by Bellini, a physician and anatomist, born in Florence, Italy, in 1643, to a syphon-barometer having its two wide legs united by a narrow tube, so that it could be used either in its ordinary position as a barometer, or in the reversed position as a thermometer. In the construction of the instrument there was a wide sealed leg of the barometer which served as a bulb of the thermometer. The word is also applied to a thermometer which indicates the atmospheric pressure at the boiling point of water. The instruments used for this purpose were first applied by Wollaston. They consisted of small metallic vessels for boiling water, fitted with delicate thermometers, graduated from 80 degrees to 100 degrees in such a way that even the one hundredth part of a degree might be estimated, thus making it possible to ascertain the height of a place to within 10 feet by means of the boiling point.

THERMO-DYNAMICS, or the **DYNAMICAL THEORY OF HEAT**, though literally merely the science of the relations of heat and work, is now very generally employed to denote the whole science of **ENERGY**. See **FORCE**. We propose in this place to give a general sketch of this grand modern generalization, supplementary to what will be found in the article just referred to; but, for the sake of continuity, we must repeat a little of what was there given, though in a somewhat different form.

Energy is strictly defined as the power of doing work (q.v.), and is of one or other of two kinds—*potential* or *kinetic*. A raised weight, a wound-up spring, gunpowder, and the food of animals, are instances of stores of potential energy. A missile in motion, wind, heat, and electric currents are instances of kinetic energy. Sound, light, and other forms of wave-motion (see **WAVE**), are all instances of mixed potential and kinetic energy.

The modern theory of energy contemplates its

CONSERVATION,
TRANSFORMATION, and
DISSIPATION.

The CONSERVATION OF ENERGY is the statement of the experimental fact, that energy is, like matter (q.v.), indestructible and uncreatable by any process at the command of man.

The TRANSFORMATION OF ENERGY is the statement of the experimental fact, that any one form of energy may in general be transformed wholly or partially into any other form. This used to be known as the CORRELATION OF FORCES. But it is subject to the condition derived from the first fact, that the portion transformed retains its amount unchanged. It is also subject to the law of DISSIPATION, or degradation, which is a statement of the experimental fact, that energy generally tends at every transformation to at least a partial transformation into heat; and that, once in that form, it tends to a state of uniform distribution, in which no further transformation is possible.

The original energy of the universe, therefore, though still of the same amount as at creation, being in a state of ceaseless transformation, has been in great part frittered down into heat, and will at length take wholly that final form.

The history of the grand discoveries which are briefly summarized in these few lines, has been much discussed of late—especially in the *Philosophical Magazine*—and is now pretty clearly ascertained.

Newton took the first great step. In a scholium to his third law of motion (q.v.), he lays down in a few clear words the conservation of energy as the embodiment of the experimental results known in his day with reference to forces and visible motions. Part of this statement of Newton's was afterward reinvented under the name of conservation of vis-viva; but all that Newton really wanted to enable him to complete the conservation of energy was an experimental knowledge of the nature of heat, electricity, etc. That heat is motion of some kind, not matter, and that the laws of its communication are the same as those of the communication of visible motion, was experimentally proved at the very end of last century by Davy. Rumford had almost completed a proof a year or two before; but he had also made a very fair attempt to determine the "mechanical equivalent" of heat—i.e., the quantity of heat which is equivalent to a given amount of mechanical work. That there is such an equivalent is at once evident by looking at Davy's discovery in the light of Newton's scholium already referred to. But though the dynamical theory of heat was thus really founded in 1799, it was not generally received. The first to recall attention to it was Séguin, nephew of the celebrated Montgolfier (from whom he states that he derived his views), who, in 1839, distinctly enunciated the equivalence of heat and mechanical work, and sought to prove by experiment that heat disappears, or is put out of existence, in the production of work from a steam-engine.

In 1842 Mayer published a short note, in which he enunciated the conservation of energy as a metaphysical deduction from the maxim, *Causa æquat effectum*. He made no experiments to prove this general statement, but he made a calculation of the mechanical equivalent of heat from the specific heats of air—assuming that when heat is produced by compression, its amount is the equivalent of the work spent in compressing. His result was erroneous, because his data were imperfect. But it appears that his assumption, quite unwarranted as it was, is really very nearly true for air.

In 1843 Colding, led also by some metaphysical speculations, propounded the doctrine, but endeavoured to base it upon actual experiments. Finally Joule, also in 1843, published an experimental determination of the mechanical equivalent of heat (770 foot pounds as the work required to heat a pound of water one degree Fahr.), which is within half per cent of the most trustworthy results since obtained. Joule had been, since 1840 at least, making quantitative determinations of equivalence between various forms of energy; and was led to propound the general law of conservation of energy by the only legitimate process—viz., experiment, as contrasted with metaphysical assertions of what ought to be. The complete foundation of the science on a proper basis is thus due to him; though, as we have seen, portions of it were established thoroughly by Newton and by Davy.

Before we consider what are the principal features of the theory as now developed, it is necessary to refer to the admirable investigations of Fourier and Carnot, which, though in some respects defective, must be considered as real advances. Fourier's great work, *Théorie de la Chaleur*, is devoted to the laws of conduction and radiation, i.e., to the dissipation, of heat, and is one of the most remarkable mathematical works ever written. Carnot's work, *Sur la Puissance Motrice du Feu*, is the first in which any attempt is made to explain the production of work from heat. It is unfortunately marred by his assumption that heat is a material substance, though it is only fair to say that he expresses grave doubts as to the truth of this hypothesis.

(We borrow our notice of Carnot from a paper by sir W. Thompson (q.v.) in the *Transactions of the Royal Society of Edinburgh*, 1849.)

He begins his investigation by premising the following correct principle, sadly neglected by many subsequent writers: "If a body, after having experienced a certain

number of transformations, be brought identically to its primitive physical state as to density, temperature, and molecular constitution, it must contain the same quantity of heat as that which it initially possessed." Hence he concludes that when heat produces work, it is in consequence of its being *let down* from a hot body to a cold one, as from the boiler to the condenser, of a steam-engine. His investigation, though based on an erroneous hypothesis, is extremely ingenious, and forms the foundation of the modern theory. We give a sketch of it, preparatory to our account of the present state of the theory, and for this purpose we choose a somewhat hypothetical case, as simpler than the most common practical one. This the case of a piston working air-tight in a cylinder closed at the bottom.

Suppose we have two bodies, A and B, whose temperatures, S and T, are maintained uniform, A being the warmer body, and suppose we have a stand, C, which is a non-conductor of heat. Let the sides of the cylinder and the piston be also non-conductors, but let the bottom of the cylinder be a perfect conductor; and let the cylinder contain a little water, nearly touching the piston when pushed down. Set the cylinder on A; then the water will at once acquire the temperature S, and steam at the same temperature will be formed, so that a certain pressure must be exerted to prevent the piston from rising. Let us take this condition as our starting-point for the cycle of operations. 1. Allow the piston to rise gradually; work is done by the pressure of the steam, which goes on increasing in quantity as the piston rises, so as always to be at the same temperature and pressure. And *heat is abstracted from A*, namely, the latent heat of the steam formed during the operation. 2. Place the cylinder on C, and allow the steam to raise the piston further. More work is done, more steam is formed, but the temperature sinks on account of the latent heat required for the formation of the new steam. Allow this process to go on till the temperature falls to T, the temperature of the body B. 3. Now, place the cylinder on B; there is of course no transfer of heat; because two bodies are said to have the same temperature when, if they be put in contact, neither parts with heat to the other. But if we now press down the piston, we do work upon the contents of the cylinder, steam is liquefied, and the latent heat developed is at once absorbed by B. Carry on this process till the amount of heat given to B is exactly equal to that taken from A in the first operation, and place the cylinder on the non-conductor C. The temperature of the contents is now T, and the amount of caloric in them is precisely the same as before the first operation. 4. Press down the piston further, till it occupies the same position as before the first operation; additional work is done on the contents of the cylinder, a further amount of steam is liquified, and the temperature rises.

Moreover, it rises to S exactly, by the fundamental axiom, because the volume occupied by the water and steam is the same as before the first operation, and the quantity of caloric they contain is also the same—as much having been abstracted in the third operation as was communicated in the first—while in the second and fourth operations the contents of the cylinder neither gain nor lose caloric, as they are surrounded by non-conductors.

Now, during the first two operations, work was done by the steam on the piston; during the last two, work was done against the steam; on the whole, the work done by the steam exceeds that done upon it, since evidently the temperature of the contents, for any position of the piston in its ascent, was greater than for the same position in the descent, except at the initial and final positions, where it is the same. Hence the pressure also was greater at each stage in the ascent than at the corresponding stage in the descent; from which the theorem is evident.

Hence, on the whole, a certain amount of work has been communicated by the motion of the piston to external bodies; and the contents of the cylinder having been exactly restored to their primitive condition, we are entitled to regard this work as due to the caloric employed in the process. This, we see, was taken from A, and wholly transferred to B. It thus appears that *caloric does work by being let down from a higher to a lower temperature*. And the reader may easily see that if we knew the laws which connect the pressure of saturated steam, and the amount of caloric it contains, with its volume and temperature, it would be possible to apply a rigorous calculation to the various processes of the cycle above explained, and to express by formula the amount of work gained on the whole in the series of operations, in terms of the temperatures (S and T) of the boiler and condenser of a steam-engine, and the whole amount of caloric which passes from one to the other.

Though the above process is exceedingly ingenious and important, it is to a considerable extent vitiated by the assumption of the materiality of heat which is made throughout. To show this, it is only necessary to consider the second operation, where *work is supposed to be done* by the contents of the cylinder expanding *without loss or gain of caloric*, a supposition which our present knowledge of the nature of heat shows to be incorrect. But it is quite easy, as seems to have been first remarked by J. Thomson in 1849, to put Carnot's statement in a form which is rigorously correct, whatever be the nature of heat. J. Thomson says: "We should not say, in the third operation, 'Compress till the same amount of heat is given out as was taken in during the first.' But we should say, 'Compress till we have let out so much heat that the further compression (during the fourth stage) to the original volume may give back the original temperature.'" It is but bare justice, however, to acknowledge that Carnot himself was by no means satis-

fied with the caloric hypothesis, and that he insinuates, as we have already seen, more than a mere suspicion of its correctness.

If we carefully examine the above cycle of operations, we easily see that they are *reversible*, i.e., that the transference of the given amount of caloric back again from B to A, by performing the same operations in the opposite order, requires that we expend on the piston, on the whole, as much work as was gained during the direct operations. This most important idea is due to Carnot, and from it he deduces his test of a *perfect* engine, or one which yields from the transference of a given quantity of caloric from one body to another (each being at a given temperature) the greatest possible amount of work. And the test is simply that *the cycle of operations must be reversible*.

To prove it, we need only consider that, if a heat-engine, M, could be made to give more work by transferring a given amount of caloric from A to B, than a reversible engine, N, does, we may set M and N to work in combination, M driven by the transfer of heat, and in turn driving N, which is employed to restore the heat to the source. The compound system would thus in each cycle produce an amount of work equal to the excess of that done by M over that expended on N, without on the whole any transference of heat; which is of course absurd.

The application of the true theory of heat to these propositions was made in 1849, 1850, and 1851 respectively, by Rankine, Clausius, and sir W. Thomson. Rankine employed a hypothesis as to the nature of the motion of which heat consists, from which he deduced a great many valuable results. Clausius supplied the defects of Carnot's beautiful reasoning; accommodating it to the dynamical theory by a very simple change, and evolving a great number of important consequences. But by far the simplest, though at the same time the most profound, writings on this subject, are those of sir W. Thomson, to be found in the *Transactions of the Royal Society of Edinburgh*; and these must be consulted by any reader who desires to have a clear statement and proof of thermo-dynamical laws, not complicated by unnecessary hypotheses or formulæ, and yet perfectly general in its application. See also Tait's *Thermo-Dynamics* (2d ed. 1877).

In its new form, thermo-dynamics is based on the two following laws:

Law I. (Davy and Joule.) *When equal quantities of mechanical effect are produced by any means whatever from purely thermal sources, or lost in purely thermal effects, equal quantities of heat are put out of existence, or are generated.*

Law II. (Carnot and Clausius.) *If an engine be such that, when it is worked backward, the physical and mechanical agencies in every part of its motions are all reversed, it produces as much mechanical effect as can be produced by any thermo-dynamic engine, with the same temperatures of source and refrigerator, from a given quantity of heat.*

The proof of this second law differs from that of Carnot (already given as regards reversible engines) by being no longer based on the supposition of the materiality of heat, but on the following axiom, in some of its many possible forms: It is impossible, by means of inanimate material agency, to derive mechanical effect from any portion of matter by cooling it below the temperature of the coldest of the surrounding objects. It will be easily seen that the pair of engines (one reversible) before mentioned would, if worked in combination, form a perpetual motion; and, besides, would constantly transfer heat from a colder to a warmer body.

One of the immediate and most important deductions from these principles is—that only a fraction of the heat employed in any engine is converted into useful work (the remainder being irrecoverably lost). This fraction was shown by Thomson to be capable of expression as

$$\frac{S-T}{S};$$

where S and T are the temperatures of the source and condenser, *measured from the absolute zero* of temperature. See HEAT. Thus, an air-engine, in which a far greater range of temperature can be safely used than in a steam-engine, employs effectively a much larger portion of the heat supplied to it; and there is no doubt that air-engines would supersede steam-engines, if we could get a material capable of enduring the great heat required.

THERMO-ELECTRICITY treats of the currents that arise from heating the junction of two heterogeneous conductors. Such currents can be obtained in many ways, but we shall here simply indicate the more important.

Thermal Currents with one Metal.—Take a copper wire, cut it in two, and fix each half in one of the binding screws of a galvanometer. Heat one of the free ends to redness, and press it against the other, and a current will be generated, passing at the junction from the hot to the cold end, as shown by the deflecting needle. In almost all cases where portions of the same metal at different temperatures are pressed together a current is produced, the direction of which depends on the metal, and even on the structure of the same metal.

Currents are also obtained when two portions of the same metal or piece of metal have different structures, and the point where the two structures meet is heated. If, for instance, one piece of wire be hard-drawn and the other part annealed, when the seat of change from the one to the other is heated, a current is produced. Or if the whole be annealed, and one part of it be hammered, the hammering makes the other part harder, and the current, when the junction is heated, passes from the soft to the

hard part. The direction of the current differs with different metals in these circumstances. Even the difference of structure introduced by the twisting of a portion of a wire causes a current to flow when the wire is heated in the vicinity of the twist. Thus, when a knot is tied on a platinum wire, or when part of it is coiled into a spiral, a current passes always toward the knot or coil when the flame of a spirit-lamp is directed on a portion of the wire near the knot or spiral. The twisting, in this case, acts as hardening or hammering would do. By running the flame of a spirit lamp along a metal, it frequently happens, more especially if it be of a crystalline structure, that currents are produced at certain points. These points are supposed to indicate a change in structure. If a bar of fused antimony have its ends connected with a galvanometer, and examined in this way, *neutral points* are generally found. The flame of a lamp generates a current near these points, always passing toward the point, and changing in direction with the change of the side on which the flame is applied. Bismuth shows neutral points, but the current always goes from the cold to the hot part across the neutral point. In bars of those metals which are crystallized regularly and slowly, no neutral points are found.

Thermal Currents with two Metals.—A current is always obtained when the point of junction of any two metals is heated. The two metals which show this property in the greatest degree are bismuth and antimony. When a bar of antimony, A (fig. 1), is soldered to a bar of bismuth, B, and their free extremities are connected with a galvanometer, G, on the junction being heated, a current passes from the bismuth to the antimony, as shown in the figure. When S is chilled by applying ice, or otherwise, a current is also produced, but in the opposite direction. Such a combination constitutes a thermo-electric pair. Applying the same mode of explanation to this pair that we apply to the galvanic pair (see GALVANISM), bismuth is positive within and negative without the pair, antimony negative within and positive without the pair. Bismuth thus forms the negative pole, but positive element; antimony the positive pole, but negative element of the pair. The metals may be classed in thermo-electric just as in electro-chemical order. The following table gives them in this order, the direction of the arrow showing how the current goes within the pair. The order and numbers in this

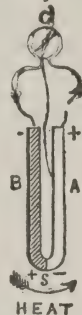


FIG. 1.

| | HEAT. | |
|--------------------|-------|-------|
| Bismuth, 29 | → | |
| Cobalt, 9 | | |
| Potassium, 5.5 | | |
| German Silver, 5.2 | | |
| Nickel, 5 | | |
| Sodium, 3 | | |
| Mercury, 2.5 | | |
| Aluminum, 1.3 | | |
| Magnesium, 1.2 | | |
| Lead, 1.03 | | |
| Tin, 1 | | |
| Copper, 1 | | |
| Platinum, .7 | | |
| Silver, 0 | | |
| Gas Coke, -.05 | | |
| Zinc, -.3 | | |
| Iron, -5 | | |
| Antimony, -10 | | |
| Tellurium, -17.9 | | |
| | ← | COLD. |

table, which are for temperatures between 40° and 100° Fahr., are those given by Dr. Matthiessen. For other temperatures, the table would be different for several of the metals.

It will be seen, that metals like bismuth and antimony, which have a crystalline structure, are best suited for a thermo-electric pair. Tourmaline, when heated, shows an opposite electricity at each end. If it had a low conducting power like the metals just named, we might expect from it a thermo-electric current instead of mere polarity. It is probable that the crystalline structure, however, accounts for the appearance of electricity in both cases.

Thermo-electric Pile or Battery.—One bismuth-antimony pair is of very little power. To increase this, several pairs are associated together, and the same tension-arrangement is adopted as in a galvanic battery. The heat in this case must be applied only to one row of soldered faces. The current depends on the difference of temperature of the two sides. When a strong current is required, the one series must be kept in ice, or in a freezing mixture, while the other is exposed to heat radiating from a red-hot plate of iron. As in the galvanic pair, the electro-motive force is proportionate to the number of pairs; the size of the bars, like the size of the galvanic plates, merely aiding to diminish the resistance. The electro-motive force of a thermo-electric battery is small; according to Dr. Matthiessen, that of 25 bismuth-tellurium pairs equals one cell of Daniell's battery, when the one series is kept at 32° Fahr. and the other at 212° Fahr. In consequence of the low electro-motive force of the thermo-electric battery, the galvanometer to be used with it must introduce as little resistance as is consistent with the best effect on the needle. Hence special galvanometers are used, in which the coil wire is short (200 turns) and thick ($\frac{1}{8}$ inch); these are called thermo-galvanometers.

When a great number of pairs are formed into a battery, they may be conveniently arranged as in fig. 2, which shows one of 30 pairs. The odd faces, 1, 3, 5, etc., are exposed on the one side, and the even faces, 2, 4, 6, etc., on the other. The terminal bars are connected with the binding screws *n*, *p*. The interstices of the bars are filled with insulating matter (gypsum) to keep them separate, and the frame in which the whole is placed is of non-conducting matter. Such a pile in conjunction with a thermo-galvanometer (see GALVANISM) forms the most delicate thermometer for radiant heat, and is generally called a *thermo-multiplier*. When placed

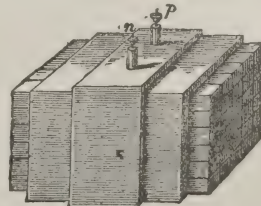


FIG. 2.

in a room, the temperature of which is equable all round, no current is produced: but if heat be radiated more on one side than another, a current ensues. If the hand, for instance, be brought near on the one side, a current indicates its radiant power; or if a piece of ice be brought near, a current is also shown, but moving in the opposite way.

Thermal Effects produced by the Galvanic Current.—As heat or cold produces a current at the junction of two dissimilar conductors, we should expect that if a galvanic current be made to pass through the junction, heat or cold would follow, and such is found to be the fact. When a current from a voltaic cell passes through a system of three rods of bismuth, antimony, and bismuth, at the junction where the current passes from bismuth to antimony, cold is produced; and at the other, from antimony to bismuth, heat. If, for instance, water be placed in a hollow at either junction, cooled to 32° Fahr, it will become frozen when the current passes from the bismuth to the antimony. When the junction of these two metals is put into the bulb of an air thermometer, so that a current can be sent through it in either way, the air expands when the current goes from antimony to bismuth, but contracts when it goes in the opposite way. See THERMO-ELECTRICITY, where the theory of energy is applied to the explanation of the various phenomena.

Seebeck was the discoverer (1821) of thermo-electricity; Nobili invented the thermo-electric pile (1834); Peltier (1834) first observed the thermal effects of galvanic currents at the junction of heterogeneous conductors. See ELECTRIC HEATING.

THERMO-ELECTRICITY AND THERMO-MAGNETISM. If the ends of an iron wire be attached by twisting or soldering to the extremities of the copper wire of a galvanometer, and one of these junctions be heated, the galvanometer indicates the passage of a current in the circuit in a direction from copper to iron through the heated junction. The first application of the theory of energy to this phenomenon is of course as follows: Since heating the junction produces the energy of the current, part of the heat must be expended in this process; though it is of course entirely recovered as heat in the circuit, if the current be not employed to do external work. The existence of the current from copper to iron is thus associated with the cooling of the junction; and it had been experimentally shown by Peltier, that if an electric current be passed through a circuit of iron and copper, originally at the same temperature throughout, it produced cold when passing from copper to iron, and heat when passing from iron to copper. If the two junctions be maintained each at a constant temperature, a constant current passes from the warmer to the colder junction through the iron wire; and by the conservation of energy, the heat developed in the circuit (together with the equivalent of the external work done, if the current be employed to drive an electro-magnetic engine) is equal to the excess of the heat absorbed at the warmer junction over that given out at the colder, precisely as in the case of a heat-engine. So far the process presents no difficulties. But it was discovered by Cumming in 1823, that not only is the strength of the current *not* generally proportional to the difference of temperatures of the junctions, but that if the difference be sufficiently great, the current may, in many cases, pass in the opposite direction. Thus, in the copper-iron circuit, at the temperature 300° C. of the hot junction, the current passes through it from iron to copper. Thomson (Bakerian lecture—*Phil. Trans.* 1855—"On the Electrodynamic Properties of Metals") applied the principle of energy to this case, and derived from it the conclusion, that one of three things must happen, the most unexpected of which was found by experiment to be the actual one—*viz.*, the startling result, that *a current passing in an iron bar or wire from a hot to a cold part produces a cooling, but in copper a heating effect.* This very remarkable discovery, which, taken in connection with that of Peltier, gives the key to the whole subject of thermo-electricity, has been made the subject of a valuable experimental investigation by Le Roux (*Annales de Chimie*, 1867).

The theory of such phenomena (and of others far more complex, involving, for instance, crystalline arrangement), in complete accordance with the conservation of energy, has been given by Thomson (*Trans. Royal Soc. Edin.* 1854); but it would be inconsistent with the character of this work to enter into any details on so abstruse a subject. A similar remark must be made regarding his application of the principle to the subject of thermo-magnetism, or the relation of the magnetizability of various substances to their temperature; one or two of his results may, however, be mentioned. Thus, iron at a moderate or low red-heat experiences a heating effect when allowed to approach a magnet, and a cooling effect when slowly drawn away from it; while in cobalt, at ordinary temperatures, exactly the opposite effects are produced. Similar effects are in general produced when a doubly-refracting crystal is turned in the neighborhood of a magnet.

THERMOMETER (Gr. literally, *heat measurer*), a term which, in spite of its derivation, is usually restricted to instruments which measure temperature (see HEAT) by the *expansion* of bodies. Like that of the telescope and microscope, and many other valuable pieces of philosophical apparatus, its early history is very obscure. There are various claimants who seek to share at least a part in the credit of its invention; and they agree pretty well in referring it to somewhere in the beginning of the 17th century. We shall not waste space in endeavoring to settle such matters of history, but proceed at once to

a description of the forms of the instrument now most commonly used; after which we shall say a few words about the actual value of their indications, and finish by a rapid sketch of a few other instruments also adapted for the measurement of temperature, but not usually known by the name of thermometer.

Let us commence with the ordinary spirit-thermometer, as it is called; where the indications are given by the expansion of a quantity of alcohol which fills entirely a glass bulb, and partially a narrow tube attached to it.

To construct such an instrument, a capillary tube is selected, of as uniform a bore as possible. The easiest method of testing its uniformity is to introduce a column of mercury, about an inch long, into the tube, and gradually move it along by inclining the tube, carefully measuring the length of the column in each of its successive positions. It is obvious that the column will be longer the smaller is the mean section of the portion of the tube occupied at any time by the drop of mercury. If considerable differences of length are found, the tube is rejected at once. The best tubes are those which, if showing any change, taper very slowly but nearly uniformly from one extremity to the other; a defect which can easily be allowed for in the subsequent graduation of the instrument. A bulb is blown on one end of the selected tube; large, if the instrument is meant to be very delicate; small, if a common instrument is to be made, or one which will work through a great range of temperature. The bulb is heated to expand the contained air, and then the open end of the tube is plunged into alcohol, usually tinged with coloring matter, for greater visibility. As the bulb cools, the atmospheric pressure on the alcohol in the vessel forces some of it into the stem, and perhaps a little into the bulb. The tube being then inverted, a few dextrous taps suffice to shake the greater part of the alcohol into the bulb. The lamp is again applied, with caution, until the alcohol boils, and the rapidly escaping vapor drives the air almost entirely from the tube, whose open end is immediately plunged again into the colored spirit. Unless the stem be nearly 40 ft. in length—and thermometers have been made by Forbes (q.v.) of a length approaching to this for the measurement of underground temperature—the alcohol fills the whole of the ball and stem as soon as the glass has cooled. The bulb is again cautiously heated, so that, by the expansion of the spirit, such a portion may be expelled, that, when the whole has again cooled, the level of the liquid in the tube may stand near some point previously determined on with reference to the particular employment for which the instrument is destined. Finally, the lamp being again applied to the tube, near the upper surface of the liquid, that portion of the spirit is again made to boil; and while the vapor keeps the free end of the tube clear of air, that end is hermetically sealed; and the glass-blower's part of the work is done. A somewhat similar, but more difficult process has to be gone through, if other liquids, such as ether, sulphuric acid, mercury, etc., are employed to fill the bulb; each of these liquids having its own special use in certain philosophical inquiries, as we shall presently see. It only remains that the instrument be *graduated*, so that some definite information may be given by its indications.

In the older thermometers, the scale was arbitrary, so that no comparable readings could be taken by means of different instruments. In the finest modern instruments, also, the scale is usually quite arbitrary, being, in fact, engraved on the tube during the process of calibration above described. But then, by careful observation, certain definite temperatures are measured in terms of this arbitrary scale, so that the value of a degree and the position of some definite zero-point are determined for it, and the result engraved on the tube. These numbers enable us, by an easy calculation, to reduce the observed reading of the fine instrument to its equivalent in some of the standard scales.

At present, we assume, what is very nearly true for mercury at least, that equal increments of bulk correspond to equal increments of temperature. All, then, that is necessary is to fix two definite temperatures, and assign their positions on our scale. Water being one of the most common bodies in nature, and being everywhere easily obtainable in a state of great purity, is usually employed; and its *freezing* and *boiling* points are taken as the definite points. The temperature of freezing water or of melting ice is almost absolutely fixed, for (see HEAT) pressure alters it only very slightly. It is otherwise with the boiling-point of pure water, for this is considerably raised by increase of pressure; so much so, in fact, that if the barometer be not attended to, an error of several degrees is possible. Hence we must define the particular pressure, usually 30 in., at which the boiling-point is to be determined. The thermometer, constructed (so far) as above described is to have its bulb, and nearly the whole of the portion of the stem which contains liquid, immersed in pounded ice, from which the melted portion is freely trickling; and when the level of the spirit has become stationary, its position, the *freezing-point*, is marked on the tube. Similarly, the barometer standing at 30 in., the bulb is inclosed in the steam immediately above the surface of water freely boiling. We thus obtain the *boiling-point*. It only remains that we decide by what numbers these points shall be indicated, because (on account of the nearly uniform expansion of mercury) then the remaining divisions can be at once filled in by dividing the interval between them into equal parts, or, if necessary, allowing for a slight taper in the tube. The only scales which require mention are those of Fahrenheit, Réaumur, and Celsius. Of these, the first is commonly used in Britain, the second in Germany, and the third in France: but this last, under the name of the *centigrade* scale, is almost exclusively used

by scientific men of all nations. The relations of these scales will be easily understood by means of the following figure:

| | | | | | |
|-------|---|----|----|-----|-----|
| Fahr. | 0 | 32 | 77 | 122 | 212 |
| | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| Réau. | 0 | 20 | 40 | 80 | |
| | ⋮ | ⋮ | ⋮ | ⋮ | ⋮ |
| Cent. | 0 | 25 | 50 | 100 | |

In the Fahrenheit scale, the freezing-point is 32°, and the boiling-point 212°, so that the space between these is divided into 212 — 32, or 180, equal parts or degrees. In the others, the freezing-point is the zero, but the boiling-point is 80° and 100° respectively. It is of course perfectly easy to reduce from one of these scales to another. Thus—What is the centigrade reading for 77° Fahr. (See the dotted line in the figure)? The numbers in Fahrenheit's scale are all too great by 32, because 32°, and not 0°, stands for the freezing-point. Subtract this from 77, and we have 45. Hence the required number of centigrade degrees must bear the same ratio to the 100 from freezing to boiling in that scale that the 45 bears to the 180° between the same limits in Fahrenheit's. The requisite number is therefore

$\frac{45}{180} 100 = 25^\circ \text{ C.}$ In words—*To convert Fahrenheit to centigrade, subtract 32, and multiply by $\frac{100}{180}$, or $\frac{5}{9}$.* Vice versâ—*To pass from centigrade to Fahrenheit, multiply, by $\frac{9}{5}$, and*

add 32. Thus the Fahrenheit value of 50 C. is $\frac{9}{5} 50 + 32 = 122$, as in the figure. Of course the similar processes with Réaumur's scale present no difficulty.

It is supposed that Fahrenheit fixed his zero at the point of greatest cold that he had observed, possibly in Iceland, more probably by means of a freezing mixture, such as snow and salt, or sal-ammoniac. It is much to be desired that the centigrade scale alone were employed.

A mercurial thermometer ceases to be of use for temperatures only a little above the freezing point of mercury; but it has a wide range upward, as mercury does not boil till about 600° C. On the other hand, a spirit-thermometer, though of little use beyond about 50° or 60° C., as alcohol boils at 70° C., is useful for any degree of cold yet produced, as alcohol has never yet been frozen. When extreme sensitiveness is required, ether being considerably more expansible than alcohol, is sometimes employed; as by Thomson in detecting the effect of pressure on the freezing-point of water. Water, again, would be about the very worst substance with which a thermometer could be filled; for not to speak of its expanding in the act of freezing, and therefore necessarily bursting the instrument, if it were ever allowed to reach the freezing-point, its scale would read partly backward and partly forward; for as ice-cold water is gradually heated up to 4° C., it contracts, and begins to expand again after that limit has been passed.

To make thermometers self-recording, various schemes have been proposed, of which we shall notice only one or two. Those most commonly used indicate only *maximum* and *minimum* temperature during each 24 hours; or during the interval which has elapsed since they were last set. The usual arrangement consists of two thermometers, a mercurial and a spirit one, fixed horizontally to the same frame, with their bulbs at opposite ends of the frame. Above the mercury is a small piece of steel or ivory, and in the spirit a small and light float of glass or enamel. Capillary forces prevent the steel from entering the mercury, and the enamel from leaving the spirit. As the mercury expands, it pushes the steel before it, and when it again contracts, it leaves it behind, the end nearest the mercury thus remaining at the highest or maximum indication which that thermometer has given. In the spirit-thermometer, the liquid, as it expands, freely passes the enamel, and leaves it undisturbed; but it can never contract so as to leave it dry. It therefore pulls the enamel back when it contracts, and thus the extremity furthest from the bulb marks the lowest point which the spirit has reached, or the minimum temperature. To set this instrument, incline it so that the steel falls back to the surface of the mercury—the enamel at the same time comes to the surface of the spirit.

The best mode of registration is undoubtedly the photographic. For this purpose, a mercurial thermometer is placed vertically before a narrow slit, in such a way that no light can pass through the slit save above the level of the mercury in the tube. A gas flame is kept burning at some distance in front of the slit, the bulb of the thermometer being protected from its radiation; and behind the slit a sheet of prepared photographic paper is exposed to the narrow line of light which passes above the mercury. This paper is fixed on a cylinder with a vertical axis, which is made to revolve uniformly by clockwork. Lines are drawn by the clockwork on the paper, giving the position of the slit at each hour of the 24, or the gas-flame is mechanically reduced or eclipsed at intervals of an hour; so that the record, when photographically developed, gives the tempera-

ture for every minute of the day and night; the portion of the paper which has been exposed to the light is blackened.

Among ordinary meteorological instruments the *wet-bulb* thermometer is deserving of notice. It is simply an ordinary thermometer, with the bulb covered with paper or cotton-wool, kept constantly moist by the capillary action of a few fibers connecting it with a small vessel of water. If the air be *saturated* with moisture (see DEW, EVAPORATION), there will be no evaporation, and the wet-bulb thermometer will give the same indication as the dry-bulb. But the drier and the warmer the air is the faster does the water evaporate, and (the latent heat of evaporation being mainly taken from the moist bulb) the lower does the mercury sink in the moist-bulb instrument. The difference between the readings of the two instruments, compared with the actual temperature, as shown by the dry-bulb, thus leads to a determination of the hygrometric state of the air.

So far, we have spoken of the instruments now in common use. But the *air-thermometer* was probably the oldest form; and possesses a scientific superiority over those just described. Theoretical and experimental investigations, connected with the modern dynamical theory of heat (see FORCE, HEAT), show that equal increments of heat produce almost exactly equal changes of bulk in a nearly perfect gas, such as air, if the pressure to which it is exposed be constant. Hence, temperature, as measured by an air-thermometer, gives a true indication of the quantity of energy present in the form of heat. As the comparison of an air-thermometer with a mercurial one shows that, for temperatures not greater than 300° C., or 572° Fahr., the indications of the two agree very closely, the ordinary mercurial thermometer practically possesses within these limits the same advantage.

As the pressure of a gas depends on the amount of heat it contains, the *absolute zero* of temperature, or the temperature of a body wholly deprived of heat, may be determined by finding the temperature at which a perfect gas would cease to exert pressure. For ordinary temperatures, it is found (see HEAT) that air increases in bulk by .3665, and hydrogen by .3668 of its bulk, when heated under constant pressure from 0° to 100° C. Again, by Boyle's law, if the air be compressed again, at constant temperature 100° C., to the bulk it had at 0° C., its pressure is increased by .3665 of its former amount. Thus, p_0 being the pressure at temperature 0° C., p that at t° C., we have, when the volume is kept constant,

$$p_t = p_0 (1 + .003665t).$$

If we assume this to hold for all temperatures, p_t vanishes when

$$1 + .003665t = 0;$$

$$\text{or } t^{\circ} = -274^{\circ} \text{ C. very nearly.}$$

That is to say, at 274° C., under the freezing-point of water, a perfect gas ceases to exert pressure on its containing vessel—i.e., is deprived of that thermal energy on which pressure depends.

The air-thermometers in common use are affected by the pressure, as well as the temperature of the atmosphere. To avoid this inconvenience, Leslie and Rumford in the present century revived the *differential thermometer* of Sturmius. In this instrument, in one of its common forms, a bulb is blown at *each* end of the tube (which is bent into a U-form), and the liquid in the stem is used merely as an index, both balls being full of air. The length of the column of fluid is usually adjusted so that it can just fill one of the vertical arms and the horizontal portion of the tube; and the quantities of air in the two balls are so adjusted that the column will take this position *when the two balls are at the same temperature*. If the one ball be heated more than the other the liquid index will take a new position, and this is read off by a scale applied to either of the vertical arms. The graduation of this instrument may be effected by calculation, but it is usually done experimentally. Leslie made good use of it in his investigations on heat; and, with various adjuncts, such as coloring the glass of one ball while that of the other was left white; silvering or gilding one of the balls; covering one of them with moist silk or linen, etc., this instrument became in his hands a *photometer*, an *æthrioscope*, a *hygrometer*, etc. See *illus.*, PHYSICS, vol. XI.

To thermometers which depend for their action on the expansion of solids, the name PYROMETER (q.v.) is frequently given; but that of Bréguet, as delicate as a good ordinary mercurial thermometer, is not alluded to in that article. The principle of this very beautiful instrument may easily be explained thus. In bending a slip of wood, the fibers on the convex side are necessarily more extended than those toward the concave side. Conversely, if the fibers on one side of a slip of wood were to expand more than those on the other, the slip would bend. Bréguet solders together two thin strips of gold and platinum, or platinum and silver; for portability and concentration bends the compound strip into a helix, fixes its upper end, and attaches a horizontal index to the lower end. The least change of temperature in the surrounding air changes the length of one side of the compound slip more than the other, and the helix twists or untwists through an angle very nearly proportional to the change of temperature.

For measuring radiant heat, the most delicate instrument is the thermo-multiplier. See THERMO-ELECTRICITY.

THERMOSCOPE. An indicator of temperature. There are various kinds : (a) the *intrinsic thermoscope*, which shows any temperature whatever throughout the range of the instrument, whatever it may be, the temperature indicated being intrinsically determined by the constitution of the instrument ; (b) the *discontinuous intrinsic thermoscope*, which shows whether the temperature of the body to which it is applied is higher or lower than a given temperature depending on the intrinsic quality of the instrument ; (c) the *continuous intrinsic thermoscope*. The accuracy, whether discontinuous, or continuous, depends upon permanence of quality of the material, and of the mechanical constitution of the instrument, according to which the recognized features shall always be very accurately the same for the same temperature.

THERMOPYLÆ (literally, "the hot gates"), a famous pass leading from Thessaly into Locris, and the only road by which an invading army can penetrate from northern into southern Greece. It lies s. of the present course of the river Spercheius, between Mt. Œta and what was anciently an impassable morass bordering on the Maliac gulf. In the pass are several hot springs, from which Thermopylæ probably received the first part of its name. Thermopylæ has won an eternal celebrity as the scene of the heroic death of Leonidas (q. v.) and his 300 Spartans in their attempt to stem the tide of Persian invasion (480 B. C.). Again, in 279 B. C., Brennus, at the head of a Gallic host, succeeded, through the same treachery that had secured a victory to Xerxes in forcing the united Greeks to withdraw from the pass.

THEROIGNE DE MIRECOURT, 1762-1817, b. Luxemburg, France. Her true name was Anne Joséphe Terwagne. In 1789 she left the convent where she was receiving her education, went to Paris, and became a prostitute. She figured in the revolution as a leader of the virulent female mob. In 1791 she was seized by the allies in Holland and imprisoned in Vienna. On her return to Paris, 1793, her popularity was at first increased; but while trying to defend Brissot, her lover, she was seized, stripped, and whipped by a mob of maddened women. She became insane from this treatment, and the rest of her life was spent in *La Salpêtrière*.

THERSI TÊS, son of Agrius, whom Homer, in the *Iliad*, makes the ugliest and most impudent talker among the Greeks before Troy. His name in antiquity was a synonym for dastardy and malevolent impudence. The later poets say that he was slain by Achilles for calumniating him.

THESAU RUS. See DICTIONARY.

THESEUS, one of the most celebrated personages of the Greek heroic age. The legend of his career is differently told, but he is usually said to have been the son of Ægeus, king of Athens, by Æthra, daughter of Pittheus, king of Troezen. He was brought up at the court of his maternal grandfather, and, on reaching manhood, proceeded to his father's residence at Athens. On his way thither he performed several famous exploits, such as the destruction of Periphetes, Sinis, Phæa, the Krommyonian sow, Skiron, Kerkyon, and the fell robber Procrustes. See PROCRUSTES. After his arrival Medea sought to poison him, but her plot failed. Ægeus recognized his son, and Medea and the sons of Pallas were banished. The next feats of Theseus were the capture of the Marathonian bull, and the deliverance of Athens from its dreadful tribute of youths and maidens to the Cretan Minotaur (q. v.), in which he was assisted by the Cretan princess, Ariadne (q. v.). On his return to Athens his father Ægeus destroyed himself, and Theseus succeeded to the throne. In his new capacity of ruler, he displayed no less wisdom than he had formerly shown heroism. To him the legend ascribes the consolidation of the 12 petty commonwealths of Attica into one state, an event that certainly did occur at some period of Attic history, which was commemorated by the festival of the *Synækia*. Theseus also reorganized the Athenaic festival, and re-named it the Pan-Athenaic, founded the Isthmian games, and many other institutions ; but soon after the craving for his old stirring life returned, and having laid down his authority, he set out along with Heracles in quest of new adventures. They fought the Amazons, and Theseus carried off their queen, Antiope or Hippolyte, by whom he had a son. After the death of Antiope, he married Phædra. The legend makes him take part in the Argonautic expedition by a ludicrous anachronism, join in the Calydonian hunt, help Peirithous and the Lapithæ against the Centaurs, and assist in the attempt to rescue Persephone from the lower world (which led to a long imprisonment there, from which he was delivered by Heracles). Returning to Athens, he found that the minds of the people had been prejudiced against him during his absence, and as he could not re-establish his authority, he withdrew to Skyros, where he was treacherously destroyed by king Lycomedes. What grain of historical fact may lie in the myth of Theseus, it is hard to say. One of the most brilliant figures of the heroic age, reminding us, by his valor, wisdom, and generous love of the fair sex, of a knight of chivalry, we are loath to yield him up as a victim to the ravenous maw of criticism; yet all that can be said for his historic reality is, that so finished and admirable a prince is more likely to have been a legendary tradition of some real hero of primeval times, than a mere creature of poetic imagination.

THE'SIS, a Greek term, strictly signifies a "placing" or "setting"—e. g., Pindar's *epéon thesis* (Ode iii. 14)—the "arrangement of words" in verse; but subsequently was

employed by the philosophers (Aristotle, etc.), to denote an intellectual position that had to be maintained. This is the sense in which the word was understood by the scholastics of the middle ages.

THESMOPHORIA, a famous festival anciently celebrated in different parts of Greece, but especially in Attica, in honor of Demeter, as the *thesmophoros* or "law-giving" goddess, inasmuch as, by the introduction of agriculture, she gave the first impulse to civil society, and more especially to the honorable bond of marriage. The Thesmophoria lasted three days, from the 11th of the month Pyanepsion (October). Only married women could take part in the ceremonies. After certain preliminary purifications (among which abstinence from sexual intercourse was prominent), the women inaugurated the solemnity by marching in procession from Athens to Eleusis, where the night was spent in celebrating the mysteries of the goddess. The next day, called *nesteia*, or the "day of fasting," was spent in mourning. The women sat for a while on the ground around the statue of Demeter, and ate nothing but cakes made of sesame and honey. They next proceeded barefooted to the Thesmophorion or temple of Demeter, where they deposited their mystical offerings to the goddess. On the third day, called *kalligeneia* in honor of Demeter as the "mother of beautiful offspring," fasting was exchanged for merriment, jollity, and raillery.

THES PIS. See DRAMA.

THESSALONIANS, FIRST EPISTLE TO THE, one of the earliest epistles of St. Paul—perhaps the very earliest—was probably written at Corinth about the close of the year 52 A.D., and seems to have been occasioned by the "good tidings" which Timothy brought him of the "faith and charity" displayed by his Macedonian converts. It may be divided into two portions, a *narrative*, and a *hortatory*; the former embracing the first three chapters, and terminating with a prayer for the Thessalonians, the latter the remaining two. From the narrative portion we derive much important and deeply interesting information regarding the "church of the Thessalonians;" but perhaps its great value consists in the picture it presents to us of the apostle himself—"bold in God," yet "gentle, even as a nurse cherisheth her children;" scorning to use "flattering words," or to "seek glory" from an assertion of his apostolic dignity; nay, in the excess of a noble pride, "laboring night and day because he would not be chargeable unto any." The epistle is conspicuous for the absence of the ordinary doctrinal element; even the word "justification," it has been remarked, does not once occur: on the other hand, it is penetrated with a deep conviction of the nearness of the second coming of Christ, and with an undefined fear lest, in spite of all his labors, the "tempter" (probably, in this case, the Hellenistic Jews of Thessalonica) should seduce the Thessalonian Christians from the "faith." Schrader (*Apostel Paulus*) was the first to impugn the genuineness of the epistle. He was followed in the same line by Baur; but their opinions have met with little favor among scholars of any party.—See Lünemann in Meyer's *Commentary*; Jowett's (2d ed. 1859) and Ellicott's (3d ed. 1866) *Commentaries*.

THESSALONIANS, SECOND EPISTLE TO THE, was likewise written at Corinth, and in all probability not long after the first. It is generally thought to have been occasioned by the misapprehension of the apostle's meaning on the subject of the coming of Christ to judgment, to which the previous letter had given rise, although Hug and others considered the expression "be not troubled. . . by letter, *as from us*" (chap. ii. 2), as indicating that somebody had forged an epistle in Paul's name; and it is scarcely possible to interpret the passage at the close of the letter, "the salutation of Paul with mine own hand, which is the token in every epistle: so I write" (chap. iii. 17), otherwise than as a precaution against forgery. From its contents we gather that adversaries of the apostle had been at work among his Macedonian converts, and that they had not scrupled to misrepresent his teaching, particularly on the great topic above mentioned. Who they were we cannot be sure, but it is probable that they were Jews or Judaizing Christians. They must have obtained a considerable measure of success in their nefarious enterprise, for we are distinctly aware of a sharper and more imperious tone in the language of Paul. He now teaches more precisely that Christ could not come until the antagonistic forces in human or diabolic society had made themselves more prominent, and done their worst. The genuineness of this epistle is as certain as that of the first. See the commentaries previously mentioned.

THESSALONICA. See SALONICA.

THESSALY, the largest division of ancient Greece, lay to the s. of Macedonia and the e. of Epirus, being separated from the latter by mount Pindus, and from the former by the Cambunian mountains, the Ægean sea bounding it on the e., and the Maliac gulf and mount Æta on the south. Thessaly proper is a vast plain shut in on every side by mountains; on the n. and w. by those already named, on the s. by mount Othrys, and on the e. by mounts Pelion and Ossa, the only opening being the Vale of Tempe in the n.e., between Ossa and Olympus. The plain of Thessaly is said at one time to have been a vast lake, the waters of which found an outlet by the Vale of Tempe. This plain is drained chiefly by the river Peneius (now *Salambria*) and its tributaries, and is the most fertile in all Greece, producing in ancient times abundance of corn and cattle, and a breed of horses considered the finest in Greece.

History.—Thessaly was originally called *Æolia*, indicating that the country was at one time inhabited by *Æolians*, who, however, were either expelled (proceeding s., and taking up their residence in *Bœotia*, etc.) or reduced to slavery by immigrants from the more rugged region of *Epirus*, about 1000 B.C. As in *Laconia*, the inhabitants of Thessaly appear to have been divided into three classes—1. The *Epirote* conquerors, who became rich landed proprietors; 2. Those descendants of the original inhabitants, who, although dependent on the nobles, yet possessed a few privileges; and 3. The *Penestæ*, or those of the original inhabitants who had been reduced to serfdom, and who cultivated the lands of their conquerors, corresponding to the *helots*, although, on the whole, their condition was better. These latter frequently rebelled against their masters, who were very frequently at war among themselves. Each of the four districts into which Thessaly proper was divided was regulated by a council of its own, but they were occasionally united under a *tagus* or president, whose power and time of office appear to have been indefinite. The government, from an early time, appears to have been oligarchal in the separate cities—of which *Pharsalus*, *Larissa*, *Heracleum*, and *Pherræ* were the chief—the principal power being in the hands of the two great families of the *Aleuads* and *Scopads*, famous for their hospitality and encouragement of poets and artists. Thessaly, however, never played any important part in Grecian history, and it was only after the end of the *Peloponnesian* war that it exercised any influence on the affairs of Greece. About that time (400 B.C.), *Lycophron*, overthrowing the government of the nobles, became tyrant of *Pherræ*, and endeavored to make himself master of all Thessaly. What he failed to accomplish, his successor, *Jason*, succeeded in doing, causing himself to be elected *tagus* of all Thessaly about 374 B.C.; his assassination in 370 B.C. preventing him from attempting to become master of all Greece as he intended. The rule of *Jason's* successors became so unbearable, that, in 353 B.C., the old families called in the aid of *Philip* of *Macedon*, who compelled the “*tagus*” to abdicate, and in 344 subjected the country to *Macedonia*. Thessaly remained subject to the *Macedonian* kings till the victory by *T. Flaminius*, at *Cynoscephalæ*, in 197 B.C., restored it to the protection of *Rome*. Under the emperors, Thessaly was united with *Macedonia*, but after *Constantine* it was a separate province. In 1204 A.D., with other portions of the eastern empire, it came under the dominion of the *Venetians*, and in 1355 was taken by the *Turks*. The restoration to Greece of Thessaly s. of the *Salambria* was recommended by the *Berlin* congress in 1878, and accomplished in 1881. In 1897 Thessaly was the principal seat of the *Turko-Grecian* war, the *Turks* forcing the *Milouna* and *Raveni* passes, in the *Olympian* range on the frontier, finally occupying *Larissa* April 25. See GREECE.

THETFORD, a municipal and parliamentary borough and market t. of Norfolk, on the Little Ouse, 79 m. n.e. of London by the Great Eastern. Pop. '91, 4247.

THETIS, daughter of *Nereus* and *Doris*, was married against her will by the gods to *Peleus*, by whom she became the mother of *Achilles*. She dwelt in the depths of the sea with her father, and had, like *Proteus*, the power of changing her shape. Her hand is said to have been sought by *Poseidon* and *Zeus*, who gave up the pursuit on *Themis* declaring that the son of *Thetis* would be greater than his father.

THIAN-SHAN, or **TIEN-SHAN**, or **CELESTIAL MOUNTAINS**, a great mountain system, consisting of several ridges, mostly parallel, in central Asia, are situated to the s. and e. of lake *Issyk-kul*, in lat. about 42° north. They are said to extend in an e.n.e. direction from the vicinity of *Samarkand*, to long. about 96° e.—a distance of 1500 miles. This range was never visited by any European till *P. Semenov*, commissioned by the imperial Russian geographical society, explored a part of it in 1858. It is one of the four great ranges, trending in a general direction from w. to e., which traverse central Asia—and these respectively are the *Altai-Sayan*, or *Altai*an mountains, in lat. about 50° n.; the *Thian-shan* mountains, lat. about 42° n.; the *Kuen-lun* system, lat. about 36° n.; and the *Himalaya* mountains (q.v.). In long. 76° to 79° e., the *Thian-shan* mountains are divided into two great, nearly parallel ridges, and inclose between them a deep valley, about 15 m. in average breadth, through which the river *Narin*—the chief head-water of the *Sir-daria*—flows in a w.s.w. direction. East of these ranges, the mountains are known as the *Tengri-tagh*; and of this subdivision the chief peak is the *Tengri-Khan* (i.e., specter-prince), in lat. 42° 23' n., long. 79° 40' e., and which rises to the height of 24,000 feet. East from the *Tengri-tagh*, the *Thian-shan* mountains continue in a double chain, and at an average height of 11,330 feet. The south-westernmost branches of the T. (the *Alai* and *Trans-Alai*), running toward the *Pamir*, contain among others the “*Kaufmann*” peak, over 25,000 feet high, one of the highest in the T. system. The eastern section has the most stupendous snow fields, snow peaks, and glaciers, such as the *Petrov* glacier, over 12 miles in length, or the *Seraf-schan* glacier, which is 15.

THIBAUDIN, **JEAN**, French general, was born at *Moulins-Engilbert* (*Nièvre*) Nov. 13, 1822, and received his education at the Military School of *Saint Cyr*. His first active service was in *Africa*. He then went through the *Italian* campaign. When the *Franco-Prussian* war broke out (1870), he served as *Lieutenant Colonel*, under *General Frossard*, and fought in the battles of *Forbach* and *Gravelotte*, but was taken prisoner at the capitulation of *Metz*, Oct. 27, 1870. Escaping from his captors, he made his way to the French army, and took command of a regiment under an assumed name. After the conclusion of peace he was made a *Colonel*, and in 1882 became a *General*. He succeeded *Billot* as *Minister of War*, in 1883, and was known at once as a pronounced

Radical, hostile to the princes of Orléans. On the visit of Alfonso XII. of Spain, to Paris, in September, 1883, Thibaudin was thought to be compromised by the hostile demonstrations which took place, and was dismissed from the ministry, Oct. 5th. In 1885 he resumed his duties as a member of the Committee on Infantry, but was removed in 1887.

THIBAUT, or **THEOBALD I.**, King of Navarre, and Count of Champagne, 1201-53; b. France; brought up at the court of Philip Augustus. He was in love with Blanche of Castile, queen of Louis VIII., though 14 years her junior, and when Louis died, in 1226, it was suspected that he had been poisoned by Thibault. The latter at first allied himself with the league of nobles against Blanche, regent during the minority of her son, but was soon won over by her. On the death of his grandfather, Sancho the Wise of Navarre, in 1234, he inherited that kingdom. He went to Palestine in 1239, but was badly defeated at Gaza. He afterward took part in the persecution of the Albigenses. He was a friend of literature, and was a *trouvère* of no mean order.

THIBET, **TIB'ET** or **TUBET**, is the European name of a country in central Asia, bounded on the n. by Mongolia, on the e. by China, and on the s. and w. by Hindustan. The native name is Bod or Bodyul, the land of Bod. It covers an area of from 600,000 to 700,000 sq.m., with the north-eastern part of which we are still almost totally unacquainted. The pop. is estimated at 6,000,000.

Surface.—From an elevated tract at the western extremity of Thibet, where the Hindu-Kush and Pamir highlands meet, the mountain-system of the Kuenlun runs e., and the greater chain of the Himalaya s.e., inclosing in the angle between them the Thibetan table-land, which extends eastward to the frontier of China. Although Thibet is described as a table-land by geographers, its surface is traversed by mountain-chains, which, near its western and eastern frontiers, interlace and ramify in a complicated manner. On the southern border the height of the plateau through which the Sanpue runs, from a point near its source to H'lassa, was in 1866 carefully ascertained by barometrical observation. Along the great route from H'lassa to Gartok, in the basin of the Indus, for a distance of 800 m., the average elevation was found to be 13,500 feet. Several stages of the journey along the route were above 16,000 ft.; only one sank to 11,000. To the n. and e. of this elevated tract, the plains of Thibet are supposed to descend to much lower elevations; but accurate observations are still wanting. The Himalaya, 20 summits of which are higher than the loftiest of the Andes, stand out from the plateau, and are only connected with it by ridges of lesser elevation. They project from the highlands like buttresses which rise higher than the walls they support. In general the descent from Thibet on the s. is by three gradations, the first of which is very abrupt. The mountain-roads by which Thibet is entered from India, pass through deep ravines cut by the streams in the mountains, and present the wildest and grandest scenes described by travelers.

The mountains which rise from the table-land divide Thibet into several natural regions. The Karakorum range, which runs parallel to the Himalaya, forms with them a great valley, drained on the w. by the tributaries of the Indus, and on the e. by the Sanpu. To the whole basin of the Indus n. of the Himalaya, the name of little Thibet is sometimes given; but more generally the upper basin is known as Ngari, the middle basin as Ladakh (q.v.), or middle Thibet; and the lower as Bultistan, or lower Thibet. The countries drained by the Sanpu are described as Thibet proper, which is in turn divided into Dsang, the district of the upper Sanpu, and Wei, surrounding H'lassa, the district of the lower Sanpu. Further e. the tract drained by the tributaries of the Yang-tze-kiang, in which are Lithang and Bathang, is known as Kham. North of the basin of the Sanpu lies another region, a great elevated desert, called Khor on the w., and Katchi on the e.; and at the north-eastern extremity of Thibet is a hilly tract, in which the Hoang-ho takes its rise, and in the center of which is situated the lake Ko-ko-nor. The provisional name given to the tract is the country of the Ko-ko-nor.

Geology.—The geology of Thibet is little known except on the s. and western frontier. The highest part of the Himalaya consists of granites and crystalline strata, and in the neighborhood of the lake Manasarowar, of volcanic rocks. On the table-land, the strata belong to the most recent tertiary epoch (the Pleistocene). They lie horizontally as they were deposited, and seem to have been lifted up in one unbroken cake to their present prodigious elevation. Thibet abounds with gold, borax, salt, silver, copper, and tin, but the jealousy of the natives and the absence of fuel renders its mineral wealth unavailable. Some gold, however, has been worked.

Climate.—Thibet lies between the latitude of Naples and Cairo, and might be supposed to enjoy a similar climate. But its great elevation renders it excessively cold during the winter, when its climate resembles that of the arctic regions more than that of countries in the zone to which it belongs. The mountains and the great plains which lie between Thibet and the sea rob the winds of their moisture, and hence another peculiarity of the climate is its excessive dryness. Timber never rots, but it breaks from brittleness; flesh exposed to the wind does not become putrid, but dries, and can be reduced to a powder. The air loses its conducting power; and persons dressed in sheepskins give out long electric sparks when they approach conducting substances. During the winter, the winds are excessively high, and the weather-beaten rocks break into a dust, which mixes

with the loose alluvial soil, and with it is blown about in blinding clouds. The limit of perpetual snow is from 16,000 to 18,000 feet high on the Thibetan side of the Himalaya, while on the Indian or southern side it is in some places only 13,000—a fact attributed to the dryness and purity of the air above the table-land. The Tibetan glaciers, particularly in the mountain region of the w., are of enormous extent. Pastures and low bushes make their appearance at 18,544 ft.—2,800 ft. higher than Mont Blanc, and 1279 ft. above the snow-line on the Andes near Quito. Below this level extends a country of bare and scanty pastures. Owing to the great dryness of the air, trees (the cedar and birch) are only met with in a few scattered spots on the hills. In the great plains, the pursuits of the inhabitants are chiefly those of the pastoral tribes of the steppes of Central Asia. In the valleys, however, the soil is more productive; and fruit-trees, the vine, and the European grains are cultivated. The conditions of the climate render irrigation necessary, and the construction and maintenance of terraces along the slopes. This has given rise to a kind of agriculture characteristic of Thibet, which demands skill and continuous labor, and which has called into existence an intelligent, strong, and hardy population. Among the productions of Thibet are barley, buckwheat, grapes, and all the European fruits.

Industry.—The Thibetans have made considerable progress in the industrial arts. They are ingenious jewelers, and manufacture extensively fabrics of wool and goat's hair, Buddhist idols, etc. In spite of the inaccessible nature of the country, and the absence of good roads and bridges, the rivers being crossed by inflated skins, a great trade is carried on with the neighboring lowlands. That with China is conducted chiefly at Sinning, but partly at H'lassa, by caravans, the goods being conveyed on the backs of llamas, mules, and horses. The raw produce of Thibet is exchanged for tea, or Chinese manufactures, and European cutlery. A great trade is also carried on with Nepaul and Bhotan, from which, in exchange for the produce of Thibet, broadcloths and Indian manufactures are imported. From Turkestan the trade is no less important.

Language and Religion.—The language of the Thibetans, spoken also in Nepaul, and by the inhabitants of Bhotan, belongs to the monosyllabic or Chinese class. See PHONOLOGY. Thibetan is singularly free from dialects, from which it is concluded it spread rapidly in recent times. It has a copious literature, chiefly religious. The religion of the Thibetans is a kind of Buddhism. See LAMAISM. At the extreme w. in Bulistan, however, Mohammedanism prevails, which, having spread from Cashmere and Persia, and not from Turkestan, is Shiite.

Government.—Almost the whole of Thibet proper is now tributary to China. The government is to some extent, however, in the hands of a Buddhist hierarchy, the name of the chief priest being the Dalai-lama, and the second the Bogdo-lama. These spiritual and temporal princes rule in different parts of the country. There are Chinese soldiers in all the chief towns, and the Chinese generals have the entire control of the army, and the direction of the most important temporal affairs. Commerce is in the hands of the government, and is closely watched, there being Chinese garrisons at the entrance to all the chief passes.

There are several important towns in Thibet, of which Lassa (q.v.) is the chief.

History.—The early history of Thibet is legendary. The first king, who flourished 113 B.C., was exposed in a copper box, and afterward found swimming in the Ganges. As early as the beginning of the 5th c. after Christ, a Buddhist missionary from Cashmere is said to have penetrated into Thibet, and to have obtained a footing for the doctrines of Buddha. In 821, Thibet was compelled to pay tribute to China. Early in the 10th c., king Dharma adopted Mohammedanism; but he was killed in 925, and Buddhism was re-established. In the beginning of the 11th c., Thibet was split into several states, and its power declined. In the 12th and 13th centuries, the Chinese began to conquer the eastern parts of Thibet, which, however, did not become tributary to Peking till 1720, when they were placed under their present government. Western Thibet has been more exposed to the inroads of the Turkish tribes than of the Chinese. The former were, however, expelled from it by Aurungzebe in the 17th c., and then it was that Mohammedanism was introduced. In the early part of this century, western Thibet was annexed to the Sikh empire of Runjeet Singh. It now forms part of the territory of the Maharajah of Cashmere.

Until a comparatively recent period, Thibet was only known from the accounts given by Marco Polo and the Jesuit missionaries, travelers respectively of the 13th and 17th centuries. It was, however, visited in 1774 by George Bogle, and in 1780 by Samuel Turner, both sent by Warren Hastings on missions to the Dalai-lama. In this century it has been partially explored by Manning (1811), capt. Strachey (1846), the French Jesuits Huc and Gabet, the brothers Schlagintweit (1855-56). On May 15, 1866, it was stated to the geographical society of London that a regular survey of lower Thibet and Ladak had been completed by the Indian government. While the work was proceeding, maj. Montgomerie, the officer in charge, conceived a plan of carrying out the survey in the neighboring districts of Thibet, closed by the jealousy of the Chinese officials against Europeans. He had Hindus of education, or pundits, instructed specially to take scientific observations, and sent them, disguised as merchants, to explore Thibet beyond the Chinese frontier. The pundits traveled over and carefully surveyed that part of the country lying n. of the Himalaya, and between the frontier of Cashmere

and Illassa. They visited the great gold-fields of Thibet, which were found to extend 1000 m. s.e. of Ilchi, the mart from which the produce of the diggings is exported; and they furnished accurate and copious information about districts which, as yet, no European has been allowed to enter. One of these pundits, a semi-Thibetan, who was dispatched in 1871, succeeded in exploring 320 m. of unknown territory, discovering and marching round the great lake Tengri-nor in the n., which is 50 m. long. The journey of the pundit Nana Singh, in 1874 and 1875, is one of the most important in geographical results that have been made in the present century. Passing from Leh to Illassa, he traversed for the first time the vast lacustrine plateau of Thibet, and thence made his way into Assam. While these explorations have been made in the west of Thibet, attempts have been made to penetrate the south-eastern corner of the table-land.—See col. Montgomerie's *Reports of Trans-Himalayan Explorations; Tibet in the Last Century*, by Clements Markham (1876); Sir William Temple in the *Proceedings of the Geog. Soc.* (1882); William Rockhill, *The Land of the Lamas* (New York, 1891), and *Diary of a Journey through Mongolia and Tibet in 1891 and 1892* (Washington, 1894); and works of various travelers in the publications of the Royal Geographical Society.

THICK-KNEE, *Oedienemus*, a genus of birds of the family *charadriade*, most nearly allied to the plovers, although, from their comparatively large size, they have often been ranked with bustards. They differ from the true plovers in having both mandibles inflated toward the tip, and not merely the upper mandible. There are about half a dozen species. Only one occurs in Britain, the common THICK-KNEE (*O. crepitans*), also known as the thick-kneed plover, thick-kneed bustard, great plover, Norfolk plover, and stone curlew.

THIELT, a t. of Belgium, in the province of w. Flanders, 16 m. s.e. of Bruges. It is a well-built town, containing several interesting edifices and institutions. An important linen market takes place here annually, and the principal manufactures are linen, woolen, and cotton goods, lace, and gloves. Pop. '94, 9998.

THIERRY, JACQUES NICHOLAS AUGUSTIN, an eminent French historian, was born at Blois, May 10, 1795. He received his education in the normal school of his native town, and became a teacher in a provincial school. In 1814 he resigned this charge, came to Paris, and published his first work, entitled *De la Réorganisation de la Société Européenne*. In this treatise he considers the practicability of having one government for the whole of Europe, preserving at the same time the nationality of each people. Adopting the views of St. Simon, Thierry became the assistant of that philosopher, in which capacity he worked for three years. In 1817 he joined Comte and Dunoyer as editors of the *Censeur Européen*, in which he wrote many articles, literary, political, and historical. In 1820 he became engaged on the *Courrier Français*, in which he published his *Dix Lettres sur l'Histoire de France*. He now began to addict himself almost exclusively to historical writing. Having given up the *Courrier*, he published his masterpiece, *L'Histoire de la Conquête d'Angleterre par les Normands* in 1825, and his *Lettres sur l'Histoire* (1827), works which had great success; but his success was dearly bought, as the necessary labor seems to have ruined the eyesight of the author. Becoming quite blind in 1830, he went in that year to Hyères for the benefit of his health. Here he met Julie de Quérangal, an authoress of considerable repute, whom he married in the following year. He seems to have been able partially to resume work about this time, and in 1835 he published his *Dix ans d'Etudes Historiques*, the introduction to which is one of the most eloquent of his works. In 1840 appeared his *Récits des Temps Mérovingiens*, which work gained the great Gobert prize. The preface gives an interesting and eloquent account of the history of his own literary labors. His last publication was the *Essai sur l'Histoire de la Formation et de Progrès du Tiers Etat*, in 1853. The author died May 22, 1856, his wife having predeceased him in 1844. During his life Thierry enjoyed the success and popularity due to his industry and talents. His careful research has thrown much light on the early ages of which he has written, and dispelled much popular error regarding them.

THIERS, a manufacturing t. in France, in the dep. of Puy-de-Dôme. It stands in a pleasant valley on the right bank of the Durole, 23 m. e.n.e. of Clermont. Its manufactures of cutlery, paper, and playing-cards gave to the town a certain importance in the 17th century. Pop. '91, 11,993.

THIERS, LOUIS ADOLPHE, French historian and statesman, was b. April 16, 1797, at Marseilles. His father is variously reported to have been a locksmith, a decayed cloth-merchant, or an advocate at the parliament of Marseilles; his mother belonged to an old commercial family which had fallen into poverty. He was placed by his mother's relatives in the lyceum, where he achieved many victories over his young competitors. In 1815 he was sent to Aix to pursue the study of the law. Here he formed his friendship with M. Mignet the historian, in company with whom, as soon as he had taken his degree as advocate, he set off to Paris to seek his fortune. He lived for a time in obscurity and indigence, but, obtaining an introduction to Lafitte, he was enrolled among the contributors to the *Constitutionnel*, then the leading liberal organ. He became distinguished for the vigor and hardihood of his articles, and as in France the occupation of a journalist was at that time and for many years afterward regarded with an estimation proportioned to its influence over society, the young political writer was admitted into the most brilliant circles of the opposition. In the crowded saloons of Lafitte, Casimir Perier, the comte de Flahault, the baron Louis (the great financier of the

era), and of M. de Talleyrand, he enjoyed an intercourse with actors in the grand revolutionary drama, which was eminently useful to him in the great undertaking which he had long meditated. *L'Histoire de la Révolution Française* (1823-7) placed the briefless advocate and young political writer in the highest ranks of literary celebrity. Three editions were soon called for, and the profits upon the sale, and the gift of a share in the *Constitutionnel*, conferred upon him by an admirer, raised him to comparative affluence. Leaving his garret in the alley of Montesquieu he emerged into fame, and became one of the most prominent men of France in the two paramount fields of literature and politics. In Jan., 1830, he established a new paper of more democratic principles, the *National*. Assisted by Armand Carrel and some of the ablest men of the liberal party, Thiers in this journal waged unrelenting war against the Polignac administration, which at length, stung beyond endurance, took the desperate measure of issuing the ordinances of July. The revolution of 1830 was the result. Thiers now devoted himself to a public career, and was appointed secretary-general to the minister of finance and elected deputy for the town of Aix. His first appearance in the chamber of deputies gave no promise of his subsequent distinction. His diminutive person, his small face, encumbered with a pair of huge spectacles, and his whole exterior presenting something of the ludicrous, the new deputy, full of the impassioned eloquence of the revolutionary orators, attempted to impart the thrilling emotions recorded of Mirabeau. The attempt provoked derision, but soon subsiding into the oratory natural to him—simple, easy, vigorous, rapid, anecdotic—he became one of the most formidable of parliamentary champions. From 1832, when the Soult cabinet was constructed, he continued a minister, with one short interval, until 1836. He was by turns minister of the interior, minister of commerce and public works, and minister for foreign affairs under various chiefs—Soult, Gérard, Mortier, and Broglie. In Feb., 1836, he was nominated president of the council and foreign minister by Louis Philippe. He only held this office until Aug., 1836, when he passed into opposition. In 1840 he was again called by the king to the premiership. He refused lord Palmerston's invitation to enter into an alliance with England, Austria, and Prussia for the preservation of the integrity of the Ottoman empire, from some lingering sympathy with the principles which dictated the first Napoleon's invasion of Egypt and Syria, and a desire to accomplish by diplomatic relations with Mehemet Ali that which Bonaparte had sought to effect by force of arms—a controlling power on the part of France in Syrian and Egyptian affairs. Lord Palmerston entered into the treaty without France, Acre was taken by the English fleet, and Mehemet Ali was driven out of Syria. The popular irritation in France fostered by Thiers was excessive, and nothing but the peaceful character of Louis Philippe prevented the French nation from rushing into a war of defiance to all the powers of Europe. Thiers alarmed the continent by his threats of setting aside the treaties of 1815 and extending the French frontier to the Rhine. It was computed that he spent not less than \$40,000,000 in military and naval demonstrations. The effect of the ill blood thus generated was felt shortly afterward in the seizure of the Society islands, and in the remonstrances which the British government saw reason to address to that of France respecting the ill treatment of Mr. Pritchard, their consul at Tahiti. Louis Philippe dismissed his bellicose prime minister, and Europe again tasted the sweets of repose. He employed his leisure in historical pursuits. His *Histoire du Consulat et de l'Empire*, begun in 1845 and completed in 1860, is one of the greatest historical works of the age. At the revolution of 1848 he accepted the republic, but was banished after the *coup d'état* of 1851 (see LOUIS NAPOLEON). After a short residence in Switzerland he was permitted to return to Paris, where he published a continuation of his *History*. He re-entered the chamber in 1863, having been elected deputy for the department of the Seine by the liberal opposition. In his speeches Thiers constantly taunted the empire with the loss of foreign *prestige*; and these taunts are not to be left out of record when the disastrous war of 1870 is to be rightly accounted for. When that conflict became inevitable, he predicted the certain defeat to France it would lead to. The early disasters of the war brought him into a particularly prominent position. It was Thiers who suggested the laying waste of the country around Paris. He declined to become a member of the government of national defense, formed on the downfall of the empire; but voluntarily undertook diplomatic journeys to England, Russia, Austria, and Italy, on behalf of France—a self-imposed mission in which he was unsuccessful, but by which he acquired the unfeigned gratitude of his countrymen. According to the suggestions of these four neutral powers, Thiers opened negotiations for peace with the king of Prussia at Versailles, which, however, were for the time unavailing. After the capitulation of Paris Thiers was elected to the national assembly by the vote of a third of the French nation, and was chosen by the assembly to be head of the provisional government. Owing to his good sense the French accepted the terms of peace offered by Prussia. In 1871, after having crushed the commune and restored order, he ceased to be "chief of the executive power" of France to become "president of the French republic;" and this office he held till May, 1873, when, failing in his effort to make the republic permanent by definitive legislation, he made way for Marshal MacMahon. His death (Sept. 5, 1877) was a severe blow to the republicans of France, whose leaders had latterly come to regard Thiers, though a "conservative republican," as head of the whole republican party. Thiers had been a member of the *Académie Française* since 1836.

THIMBLE. This word is considered to be a derivative of *thumb*, and is generally used for the cap or cover, or often a simple ring, which is placed on the finger for protection from the needle while sewing. It is usually made of metal and has many small indentations to receive the head of the needle. In mechanics, it is any thimble-shaped appendage or fixture: as a tubular ring or lining, fixed or movable, placed in a hole; or a strut through which a bolt or pin passes; or a tubular cone for expanding a flue, called in England a *ferule*. As a nautical term, it signifies an iron ring encircled by a groove to receive the rope which is spliced about it, used to keep the eye of the rope from injury.

THINGVALLA. A lake in the southwestern part of Iceland between the towns of Reikiavik and Skalholt. It is about 19 miles long (n.w. to s.e.) contains several islands, and is remarkable for its picturesqueness. Its southern portion contracts into a river which flows into the Gulf of Thorlaks and thus serves as an outlet for the lake. Thingvellir on its northern shore is a village of considerable historical interest from the fact that the central moot, the Althing, a council of delegates from every inhabited quarter of Iceland, met there in the open air from 920-1800.

THIONVILLE, a fortified t. of Alsace, in the German province of Alsace-Lorraine, on the Moselle river, 20 m. n. of Metz, situated on a broad plain; population (1890), 8923. It is fortified by a wall, built under the old-school system, which ranked it as a 3d class fortress. After the French were defeated at Forbach, and retreated to Metz, this fortress greatly troubled the Prussians then laying siege to Metz. Three unsuccessful attempts to take Thionville were made by the Prussians in August, September, and October. After the fall of Metz a greater force could be spared, and the place was bombarded from early morning of Nov. 22d to the evening of the 24th, 1870, by 85 guns, when it surrendered. The fortifications were little injured by the attack, although many buildings in the place were demolished. The German name is Diedenhofen.

THIRD, the name popularly given to a musical interval, or rather to two different musical intervals, which are distinguished as the *major* and *minor* third. The major third is the interval between a note and its mediant, as between C and E; its ratio is 4 to 5, and it comprises four semitones. The minor third has for ratio 5 to 6, as from A to C, and comprises but three semitones.

THIRD HOUSE. See LOBBY.

THIRLWALL, CONNOP, D.D., 1797-1875; b. England; educated at Cambridge; became a fellow and tutor; admitted to the bar at Lincoln's Inn, 1825; relinquishing law, was ordained, 1828; rector of Kirby-under-Dale, Yorkshire; made bishop of St. David's, 1840. He published, with Charles Hare, a translation of the first two volumes of Niebuhr's *History of Rome*; and in 1835 wrote for Lardner's *Cabinet Cyclopædia* the first vol. of *History of Greece*, completed in 8 vols. He was for several years examiner of the university of London, visitor of St. David's college, Lampeter, and an associate editor of the Cambridge *Philological Museum*. He published sermons, charges, letters, and addresses, entitled *Literary and Theological Remains*.

THIRSK, a parliamentary borough in the n. riding of Yorkshire, on both banks of the Codbeck, an affluent of the Swale, 23 m. n.w. of York. It contains an old, large and handsome Gothic church, and carries on manufactures of leather and saddlery. Pop. '81, of borough, 6306; '91, 6584.

THIRST is a well-known sensation, resulting from a peculiar state of the mucous membrane of the digestive canal, but especially of the mucous membrane and the fauces, usually caused by an insufficient supply of liquid. In cases of extreme thirst, there is a peculiar sense of clamminess in the mouth and pharynx; which, with the other disagreeable feelings, is almost immediately relieved by the introduction of liquid into the stomach, where it is absorbed by the veins. That the thirst is relieved by the absorption of the fluid, and not by its action as it passes over the mucous membrane, which seems to suffer most, is proved by the facts—(1) that injection of liquids into the stomach through a tube (in cases of wounded œsophagus), and (2) the injection of thin fluids, as water, into the blood, remove the sensation of thirst. An excessive thirst is often an important morbid symptom. It may arise from two very opposite conditions—one a condition of excitement, and the other of depression. Whenever the blood is in a state requiring dilution, and is too stimulating, as in fevers and inflammation, there is thirst; and, again, in cases of excessive secretion and exhaustion; as for example in cholera and in the two forms of diabetes, there is great thirst, which sometimes also attends the lowest stages of prostration in malignant diseases. When there is a great loss of the watery portion of the blood by profuse perspiration, caused not by disease, but by hard bodily exercise in a hot atmosphere, as in the case of coal-whippers, mowers, and reapers, etc., there is always great thirst, and from two to four gallons of beer or cider a day may, in these cases, be taken with impunity, if not with advantage. Cold tea, without milk or sugar, is the most satisfying drink under these circumstances. Independently of disease, great thirst may be induced by the use of salted meat or fish, highly-peppered curries, and other stimulating dishes, the ingestion of malt liquors

drugged with salt and more pernicious matters, or of gin strengthened by sulphuric acid, etc. In all these cases the symptoms point to the natural remedy.

THIRTEEN. See SUPERSTITIONS.

THIRTY TYRANTS, at Athens, were a body of rulers invested with sovereign power after the close of the Peloponnesian war. They were all native Athenians, but members of the aristocratic party, and chosen by the Spartan conquerors, who, knowing the animosity existing between the democracy and oligarchy of Athens, hoped to rule the city through the agency of the latter. Their government was a positive "reign of terror," marked by the most infamous cruelties. Even Mitford, with all his hatred of democracy, speaks of the "shamelessness of crime" as surpassing all that had previously occurred in Grecian history. It lasted only one year, when it was overthrown by the return of the Athenian exiles under Thrasybulus.

THIRTY TYRANTS of the Roman Empire, is the collective title given to a set of military usurpers who sprung up in different parts of the empire during the 15 years (253-68 A. D.) occupied by the reigns of Valerian and Gallienus, and amid the wretched confusions of the time, endeavored to establish themselves as independent princes. The name is borrowed from the Thirty Tyrants at Athens, but, in reality, historians can only reckon nineteen—Cyriades, Macrianus, Balista, Odenathus, and Zenobia, *in the east*; Postumus, Lollianus, Victorinus and his mother Victoria, Marius, and Tetricus, *in the west*; Ingenuus, Regillianus, and Aureolus, in Illyricum and the countries about the Danube; Saturninus, in Pontus; Trebellianus, in Isauria; Piso, in Thessaly; Valens, in Achaia; Æmilianus, in Egypt; and Celsus, in Africa.

THIRTY YEARS' WAR was not properly one war, but rather an uninterrupted succession of wars (1618-48) in Germany, in which Austria, the most of the Catholic princes of Germany, and Spain, were engaged on one side throughout, but against different antagonists. This long-continued strife had its origin in the quarrels between the Catholics and Protestants of Germany, and the attempts of the former, who were the more powerful body, to deprive the latter of what liberty of worship they had obtained. The severe measures taken by the emperor, the head of the Catholic party, against the Protestant religion, led also to strictures on their civil rights; and it was to protect their political as well as their religious liberties that the Protestants formed a union, May 4, 1608, with Frederick IV., the elector palatine, at its head. The rival union of the Catholic powers, under the leadership of the duke of Bavaria, followed July 11, 1609. In Bohemia, the immense preponderance in numbers (two out of three) and influence of the Protestants had forced from their Austrian king an edict of toleration (July 11, 1609), which was at first faithfully observed; but during the reign of Matthias, sundry violations of it were made with impunity; and as the influence of Ferdinand of Styria (see FERDINAND II.), his successor, began to be felt in more flagrant partiality to the Catholics, the kingdom became a scene of wild excitement; three of the Catholic party were thrown from the window of the Bohemian council-chamber at Prague, and ultimately Ferdinand was deposed, and Frederick V., the elector palatine, chosen in his stead (1619); and count Thurn, at the head of an insurgent army, repeatedly routed the imperial troops, and actually besieged the emperor in Vienna. The Catholic princes, though as apprehensive as their opponents of the encroaching policy of Austria, crowded to the emperor's aid; and while the Protestant union and James I. of Great Britain held aloof from Frederick, whose sole allies were Bohemians (under Thurn), Moravians, Hungarians, and a Piedmontese contingent of 3,000 (under count Mansfeld), a well-appointed army of 30,000, under duke Maximilian, advanced to support the Austrians, and totally routed Frederick's motley array at Weissenberg (Nov. 8, 1620), near Prague, afterward reducing the upper, while an army of Spaniards under Spinola ravaged the lower palatinate, and the Saxons (in alliance with the emperor), occupied Lusatia. The Bohemians were now subjected to the most frightful tyranny and persecution; a similar policy, though of a more moderate character, was adopted toward the people of the palatinate—the Protestant union standing aloof, and subsequently dissolving, through sheer terror. But the indomitable pertinacity and excellent leadership of count Mansfeld and Christian of Brunswick, two famous partisan leaders, who ravaged the territories of the Catholic league, and the forced cession to Bethlem Gabor of large portions of Hungary and Transylvania, did much to equalize the success of the antagonistic parties.

Here the war might have ended; but the fearful tyranny of Ferdinand over all the Protestants in his dominions (Hungary excepted), drove them to despair, and the war advanced to its second phase. Christian IV. of Denmark, smarting under some injuries inflicted on him by the emperor, and aided by a British subsidy, came to the aid of his German co-religionists in 1624, and being joined by Mansfeld and Christian of Brunswick, advanced into Lower Saxony, while the emperor, hampered by the political jealousy of the Catholic league, was unable to oppose him. But when, by the aid of Wallenstein (q. v.), a powerful and effective army had been obtained, and the leaguers under Tilly, in co-operation with it, had marched northward, the rout of the Danes by Tilly at Lutter (Aug. 17, 1626), and of Mansfeld by Wallenstein at Dessau (April 1, 11, and 25, 1626), again prostrated the Protestants' hopes in the dust; yet a gleam of comfort was obtained from the victorious raid of Mansfeld through Silesia, Moravia, and

Hungary, though his scheme for an insurrection in Hungary failed, and his death soon after, at Zara, freed the emperor from a formidable and irreconcilable enemy. The combined imperialists and leaguers meantime had overrun North Germany and continental Denmark, and ultimately compelled king Christian to conclude the humiliating peace of Lübeck (May 12, 1629). This second great success seems to have turned Ferdinand's head, for not content with a still more rigorous treatment of the Protestants, and the promulgation of the *restitution edict*, which seriously offended even the Catholics, he stirred up Poland against Sweden, and insulted Gustavus Adolphus, both personally and in the persons of his ambassadors—insolent impertinences which he soon saw bitter reasons to regret. The Catholic league now forced him to reduce his army, and supplant Wallenstein by Tilly; while France was inciting Gustavus to the willing task of aiding the Protestants in Germany.

The war entered its third phase by the landing of the Swedes at Usedom (June, 1630), and their conquest of Pomerania and Mecklenburg. Gustavus, by the exercise of a little wholesome pressure, induced the elector of Brandenburg to aid him; and though unable to save Magdeburg (q.v.), he marched to join the Saxons, completely routed Tilly at Breitenfeld (Sept. 17, 1631); victoriously traversed the Main and Rhine valleys; again routed Tilly on the Lech (April 5, 1632), and entered Munich. By the judicious strategy of Wallenstein he was, however, compelled to return to Saxony, where he gained the great victory of Lützen (q.v.); but his death, depriving the Protestants of the only man who could force the confederate powers to preserve unity of action, was a severe blow to their cause; though the genius and indefatigable zeal of his chancellor, Oxenstierna, and the brilliant talents of the Swedish generals, preserved the advantages they had gained, till the crushing defeat of Bernard of Weimar at Nordlingen (Sept. 6, 1634) again restored to the emperor a preponderating influence in Germany. Saxony now made peace at Prague (May 30, 1635), obtaining such satisfactory terms for the Lutherans that the treaty was within three months adhered to by all the German princes of that sect, and the Calvinists were left to their fate.

Final success now appeared to demand only one more strenuous effort on the part of Austria; but Oxenstierna, resolved to preserve to Sweden her German acquisitions, propitiated Richelieu (q.v.) by resigning to him the direction of the war; and the conflict advanced into its final and most extended phase. The emperor, allied for offense and defense with the Lutherans, was now also assailed through his ally, Spain, who was attacked on her own frontier, in the Netherlands, and in Italy; Bernard of Weimar fighting independently, with the view of obtaining Alsace for himself, opposed the leaguers, while the Swedes, under Baner, held North Germany, and by frequent flying marches into Silesia and Bohemia, distracted their opponents, and prevented them, after their successes over duke Bernard, from proceeding with the invasion of France. The great victory of Baner over the Austrians and Saxons at Wittstock (Oct. 4, 1636), restored to Sweden the victor's wreath she had lost two years before; and from this time, especially under Torstensohn (q.v.) and Königsmark, the Swedes were always successful, adding a second victory of Breitenfeld (Nov. 2, 1642), one at Yankowitz (Feb. 14, 1645), and numberless ones of less note, to their already long list of successes, carrying devastation and ruin into the hereditary territories, even to the gates of Vienna, defeating the best generals of the empire, till, from a profound feeling of inability to check them, the Austrians hardly dared appear to the north of the Danube. On the Rhine the leaguers at first had great success—the Weimar troops, now in French pay, were almost exterminated at Duttlingen (Nov. 24, 1643); but after the Spanish power had been thoroughly broken in the Netherlands by Condé, the French were re-enforced on the Rhine; and under Condé and Turenne (q.v.) rolled back the leaguers through the palatinate and Bavaria, and revenged at Nordlingen (Aug. 3, 1645) the former defeat of the Swedes. The emperor was now deserted by all his allies except the duke of Bavaria, whose territories were already mostly in the hands of Turenne and Wrangel; and a combined invasion of Austria from the w. and n. was on the point of being executed, when, after seven years of diplomatic shuffling, with an eye to the changing fortunes of the contest, the peace of Westphalia (q.v.) put an end to this terrible struggle.

THISTLE, *Carduus*, a genus of plants of the natural order *compositæ*, sub-order *cynarocephalæ*, with spinous leaves, imbricated involucre, and heads of flowers, consisting of tubular hermaphrodite florets alone, very rarely diœcious, stamens free, pappus deciduous, the receptacle having chaffy bristles. The flowers are sometimes large, generally purple, rarely white or yellowish. Recent botanists have divided this genus into two genera—the true thistle (*carduus*), in which the pappus is composed of simple hairs, and the plume thistle (*cirsium* or *cnicus*), in which the pappus is feathery.—The species of both genera are numerous, and are found in most of the temperate and cold parts of the northern hemisphere, annual, biennial, and perennial herbaceous plants of considerable size.—The MILK THISTLE (*carduus marianus*), a biennial, native of Britain, and other parts of Europe, attains a height of 4 to 6 ft., and is remarkable for the milky veins of its large waved leaves. The bractæ of the involucre are subfoliaceous and recurved. The young leaves are sometimes used as a spring salad. Blanched leaves are used in winter salads. They are also used as a boiled vegetable, along with the

young stalks, after these have been peeled and soaked in water to extract part of their bitterness. The root is used as salsafy. In former times, the plant was frequently cultivated.—The creeping plume thistle (*cirsium arvense*, or *cnicus arvensis*), a species about 1 to 3 ft. high, with creeping roots, pinnatifid leaves and numerous diœcious flowers, is a very troublesome weed in fields, very common in Britain, and now too common, not only in Europe, where it is indigenous, but in America and other countries to which it has found its way. *Cirsium lanceolatum* and *C. palustre*, both common British plants, are also regarded as troublesome weeds. The former has larger flowers than any of the other species common in Britain. *Cirsium oleraceum* is a native of the n. of Europe, but not of Britain, distinguished by its yellowish flowers, which are surrounded with large yellowish involueral bractæ. The young leaves are used as a culinary esculent.—The BLESSED THISTLE (*carduus benedictus* of the pharmacopœias, *cnicus benedictus* or *cirsium benedictum* of modern botanists) is a native of the Levant and of Persia, resembling in appearance a *centaurea*; with yellow flowers enveloped in leaves, and abounding in a gossamer-like down. The whole plant has a very bitter and disagreeable taste, and besides a bitter extractive, contains much sulphate and muriate of potash and sulphate of lime. It is a powerful laxative- tonic medicine, and a strong decoction of it readily induces vomiting.—The COTTON THISTLE (*onopordon*) is a distinct genus, known by its receptacles being destitute of bristles, and coarsely and deeply honey-combed. The common cotton thistle (*O. acanthium*), a native of Europe, and found in England, but rarely wild in Scotland, if, indeed, it is a true native of that country, is, nevertheless, very generally called by gardeners and others the SCOTCH THISTLE. The national emblem of Scotland is not, in all probability, any one species of thistle in particular, as botanically distinguished; though the stemless thistle (*cnicus aculeis*, or *cirsium acule*) is in many districts of Scotland so designated. According to the common tradition, the Danes (or Norsemen?) came upon the Scots unperceived in the dead of night; and halting while their spies were trying to discover the undefended points of their opponents' camp, one of the spies chanced to tread upon a thistle of this species, and the loud imprecation which the sudden pain evoked aroused the unsuspecting Scots, who at once attacked the invaders, gained a complete victory, and dubbed the plant which had been the means of their success the Scotch thistle. The cotton thistle has large elliptic leaves, and a broadly winged stem. The young fleshy root and the stem, while still tender, are in many places boiled and eaten. The expressed juice of the plant was formerly reckoned good for cancerous sores and cutaneous eruptions.—Plants of the genus *silybum*, distinguished by its monadelphous stamens, and of the genus *echinops*, which has a very different manner of growth, and belongs to a very different section of the *compositæ*, are often to be seen in flower-gardens, where they are known as thistles. The name is also, generally with some addition, very often bestowed upon many plants which have little resemblance to any of these, except in their spinous character. *Centaurea calcitrapa* is commonly known as the STAR THISTLE (see CENTAUREA).—The CARLINE THISTLE (*carlina vulgaris*) is pretty common in dry hilly pastures in some parts of Britain.

THISTLE, ORDER OF THE, called also the order of St. Andrew. See ANDREW, ST. The following is a more complete account of its institution than is given in the article referred to. The order is of no very ancient date. The earliest-known mention of the thistle as the national badge of Scotland is in the inventory of the effects of James III., who probably adopted it as an appropriate illustration of the royal motto, *In defense*. Thistles occur on the coins of James IV., Mary, James V., and James VI.; and on those of James VI. they are for the first time accompanied by the motto, *Nemo me impune lacesset*. A collar of thistles appears on the gold bonnet-pieces of James V. of 1539; and the royal ensigns, as depicted in sir David Lindsay's armorial register of 1542, are surrounded by a collar formed entirely of gold thistles, with an oval badge attached. This collar, however, was a mere device until the institution, or, as it is generally but inaccurately called, the revival of the Order of the Thistle by James VII. (II. of England), which took place on May 29, 1687. Statutes were issued, and eight knights nominated by James; but the patent for the institution of the order never passed the great seal. After falling entirely into abeyance during the reign of William and Mary, the order was revived by Queen Anne, Dec. 31, 1703.

THLINKETS, a tribe of Indians (called Kolosh by the Russians), the chief native population of Alaska (q.v.). They inhabit the coast and islands from the intersection of the 141st meridian to the s. boundary. They lead a nomad life in the summer, laying up provisions for the winter months, winter being the only period when they occupy fixed dwellings. They derive their principal nourishment from the fish, mollusks, and algæ of the sea, preserving the latter in boxes, with herrings' spawn. They also hunt the larger marine animals, such as the seal, otter, and porpoise, and carry on a considerable trade with white settlers in fish and furs. The T. in 1880 numbered 6773. To these are usually added 788 Hyda, closely related to the T., who reside on Prince of Wales Island.

THOBURN, JAMES M., D.D., b. Ohio, 1836; grad. at Alleghany coll.; admitted on trial to Pittsburg conference, 1858; went to India as missionary, 1859; presiding elder of Calcutta district (Bengal conference), 1873-88; editor of *The Witness* 6 years; repre-

sented the India conference in gen. conference, 1876; South India conference, 1880, and the Bengal conference, 1888. Elected missionary bishop for India and Mayklasia, 1888. He has written *My Missionary Apprenticeship* and *Missionary Addresses before Theological Schools*.

THO LEN, an island in the Netherlands, province of Zealand, bounded on the s. by the Easter Scheldt, contains about 30,000 acres of rich land, and is defended from floods by strong dykes, the borders of which are planted with trees. Pop. '89, 2932.

THOLUCK, FRIEDR. AUG. GOTTREU, a German Protestant theologian; b. Breslau, March 30, 1799; educated at the univ. there and at Berlin; devoted himself to oriental studies, and pub. *Suffismus sive Theosophia Persarum Pantheistica* (Berl. 1821). His sympathy with Christianity was negative, but influenced by Neander and by baron von Kottwitz, of Silesia, he changed radically, and in 1823 pub. his *Wahre Weihe des Zeuifers* (True Consecration of the Skeptic; 7th ed. published at Hamb. 1851, under the title of *The Doctrine of Sin and the Propitiator*, and translated into English, French, Danish, Swedish, and Dutch). Next year he published his *Auslegung des Briefs an die Römer* (Exposition of the Epistle to the Romans; Berl. 1824; 4th ed. 1842; also translated into English and other languages). About the same time he was appointed extraordinary professor of theology at Berlin, and in 1825 he paid a visit to England. On his return in 1826 he succeeded Knapp as ordinary professor of theology at Halle, where, with the exception of a brief official sojourn at Rome, he remained until his death. Tholuck's position at Halle was far from pleasant at first, for the majority of the theological faculty, among whom was Gesenius, were very decided rationalists, and did all in their power to make the new professor miserable, but the latter, though not a man of very powerful intellect, was filled with a quiet, earnest, resolute faith, and he continued his evangelical labors in spite of all opposition, until they were crowned with success. The university of Halle is at present, mainly owing to Tholuck, as thoroughly Christian, though not, perhaps, so strictly orthodox, as it was in the days of Francke. His kindness (and that of his wife) toward students, especially poor students, was proverbial, and contributed not a little to his fame abroad. In 1843 he was chosen a member of the consistory of Magdeburg, where he became superior councilor in 1867. Besides the works already mentioned, we may specify among his exegetical writings his *Praktischer Commentar zu den Psalmen* (Practical Commentary on the Psalms; Hamb. 1843); *Commentar zum Evangelium Johannis* (Commentary on the Gospel of John; 6th ed. Hamb. 1844); *Commentar zum Briefe an die Hebräer* (Commentary on the Epistle to the Hebrews; 3d ed. Hamb. 1850); *Philosophisch-theologische Auslegung der Bergpredigt* (Philosophico-theological Exposition of the Sermon on the Mount; 3d ed. Hamb. 1845). Of his dogmatic writings, the principal are contained in the *Literarischer Anzeiger für Christliche Theologie und Wissenschaft*, a journal now discontinued; and in his *Glaubwürdigkeit der Evang. Geschichte* (Credibility of the Gospel History; Hamb. 1837); a treatise directed against Strauss's *Leben Jesu*. Among his contributions to the history of theology are to be reckoned his *Vermischte Schriften grösstentheils apologetischen Inhalts* (2 vols. Hamb. 1839); *Der Geist der Luth. Theologen Wittenbergs im 17. Jahr* (The Spirit of the Lutheran Theologians of Wittenberg in the 17th Century; Hamb. 1852); *Das Academische Leben des 17. Jahrh.* (The Academic Life of the 17th Century; Halle, 1853-54); and his *Geschichte des Rationalismus* (History of Rationalism), of which several parts—notably a *Vorgeschichte des Rationalismus*—have already appeared, but which is still unfinished. Besides these may be mentioned several volumes of sermons. Tholuck died at Halle, June 9, 1877.

THOMAS, a co. in s.w. Georgia, adjoining Florida, drained by the Ocklockonee river, and its branches; traversed by the Plant System railroad; about 784 sq. m.; pop. '90, 26,154. Co. seat, Thomasville.

THOMAS, a co. in n.w. Kansas, drained by the n. and s. forks of Sappa creek, by the head-waters of the Saline river, and the n. and s. forks of Saline river; about 1080 sq. m.; pop. '90, 5538. Co. seat, Colby.

THOMAS, or **DIDYMUS**, one of the twelve apostles, both of whose names signify "a twin." One of the records concerning him in John's gospel has led to his being unduly condemned as a doubter. It speaks only of his asking evidence, such as the other disciples had had, on which to rest his faith. There are various traditions concerning his labors and martyrdom, as the earlier say, in Persia and as the later, on the Malabar Indian coast. Several Roman Catholic theologians assert that traces of his presence in America are found from Paraguay to Mexico, in which last country Spanish priests pretend that the Aztec divinity Quetzalcoatl was the apostle Thomas, who introduced those features of the Aztec religion which resemble Christian and Jewish rites.

THOMAS, CHARLES LOUIS AMBROISE, composer, b. in Metz, Aug. 5, 1811. He studied at the Paris Conservatoire under Zimmermann and Kalkbrenner on the piano forte, and under Douren, Barbereau, and Lesueur in counterpoint, harmony, and composition, winning the Grand Prix de Rome in 1832. After studying three years in Italy, he returned to Paris, and devoted himself to dramatic composition. He succeeded Auber as director of the Conservatoire in 1871. In 1851 he became a member of the Académie Française, and entered the Légion d'Honneur in 1845. Thomas was one of the most noted composers of the modern French school, and stood second to Gounod, whom he resembled in style. His chief success lay in opéra comique, the

best of his works being *Mignon*, Paris, 1866. His compositions include: *Le panier fleuri*, 1839; *Le Caid*, 1849; *Le songe d'une nuit d'été*, 1850; *Psyché*, 1857; *Hamlet*, 1868; *Françoise de Rimini*, 1882; ballets; cantatas; requiems; chamber-music; and choruses for male voices, which are much esteemed. He died Feb. 12, 1896.

THOMAS AQUINAS. See AQUINAS, THOMAS.

THOMAS, EDITH MATILDA, American author, born at Chatham, O., in 1854, and educated at the Normal Institute, Geneva, O. She has contributed prose and verse to periodicals, and published the volumes of poetry, *A New Year's Masque*; *Lyrics and other Poems*; *The Inverted Torch* (1890); *A Winter Swallow* (1897).

THOMAS, GEORGE HENRY, 1816-70, b. Va.; was of mixed Welsh and French descent; entered the U. S. military academy at West Point in 1836, and graduated in 1840. He was employed in garrison duty for a brief period, and was then for two years in active service in the Florida war, and brevetted 1st lieut. for gallantry. In 1845 he was in Texas; was present at the outbreak of hostilities with Mexico; and distinguished himself at Monterey and Buena Vista, being brevetted capt. and maj. for gallant conduct. After the close of the Mexican war he served a year in Florida; three years as cavalry and artillery instructor at West Point; and then as maj. 2d cavalry, for five years in Texas. Thomas's associations had all been southern; his family and friends at home were Virginians; A. S. Johnston was col. of his regiment, Robert E. Lee lieut. col., and W. J. Hardee senior maj.; while other officers were Van Dorn, Kirby Smith, Fitz Hugh Lee, and Hood. But he adhered to the Union cause; was lieut. col. and afterward col. of the 2d cavalry; commanded a brigade in the first Shenandoah campaign, a division in the battle of Mill Spring—when he first began to awaken national attention, and was in command of the right wing of the army of the Tennessee during the siege of Corinth, where he was in full command during a great part of June, 1862. He had the center of the army of the Cumberland, and did good work at Murfreesboro; commanded the 14th army corps in the campaign of middle Tennessee in the summer of 1863; and at the ill-starred battle of Chickamauga Thomas stood firm, and resisted the concentrated attack of a victorious enemy; gaining justly the title of "the rock of Chickamauga." He commanded the army of the Cumberland at Missionary Ridge, and in the campaign of 1864, up to the capture of Atlanta. His indomitable nerve and firmness enabled him to hold his ground at Nashville, where he was envied by Hood's army; and despite urgent pressure, to remain inactive until he was ready for the final blow. When that happened, which was on Dec. 15, '64, he flung his army upon Hood with a determination and power which were irresistible; and the defeat of the confederates bore testimony to the coolness which accomplished one of the most splendid victories of the war. Gen. Grant, who had even designed assuming his command on account of the delay, was the first to acknowledge the unerring judgment of Gen. Thomas. He was at once appointed a maj.-gen. in the regular army; congress tendered him a vote of thanks; the legislature of Tennessee voted him a gold medal; and the American people recognized his ability and his success with unstinted praise. In 1865-66 Gen. Thomas commanded the military division of the Tennessee, and the department of Tennessee the following year. He was afterward transferred to the 3d military district; and to the department of the Cumberland in 1867-69. From May 15, '69 until his death, which occurred Mar. 28, 1870, he was in command of the military division of the Pacific, with headquarters at San Francisco, where he died. His remains are buried at Troy, N. Y., and there is in Washington a monument to his memory.

THOMAS, ISAIAH, LL.D., 1749-1831; b. Boston; after an apprenticeship of 11 years began business as a printer at Newburyport, 1767. His career is noteworthy as that of a patriot, publisher, and a friend of science and literature. Having removed to Boston, he published the *Massachusetts Spy*, 1770, and continued it afterward at Worcester. He boldly denounced the oppression of the colonies by the British government, and took part in the skirmish at Lexington. He opened a bookstore at Boston, and in days when communication with distant places was so limited, established branches of his business in several parts of the United States. He printed a folio edition of the Bible, 1791, and afterward many editions of smaller size. For many years he was one of the principal printers and publishers of school books for the whole country. In 1810 he published a *History of Printing in America* (2 vols., 8vo).

THOMAS, JESSE BURGESS, D.D., b. Edwardsville, Ill., 1832; son of Judge T., of the supreme court of Ill. He graduated at Kenyon coll., O., 1850; studied law, and was admitted to the bar, 1855. He afterwards entered Rochester theol. sem., but was compelled to leave through ill health, and, 1862, entered the Baptist ministry at Waukegan, Ill. His subsequent locations were in Brooklyn, San Francisco, and Chicago; and, 1874, he was recalled to Brooklyn, where he was connected with the First Baptist church until 1877. He is a forcible preacher, and is also known as an author and lecturer.

THOMAS, JOHN, 1725-76; b. Mass.; became eminent as a physician, and was a member of Shirley's medical staff in 1747. He was made a col. of the provincial forces in 1759, led a regiment at Crown Point the next year, and was at the capture of Montreal. He was one of the "sons of liberty," and a member of the provisional congress. He was appointed maj.-gen. in 1776, and during the siege of Boston was at the head of

a brigade on the Roxbury side. On the night of Mar. 4, 1776, with a force of 3,000 men, he occupied Dorchester heights, and threw up intrenchments. This movement forced the evacuation of the town by the British, Mar. 17. He afterward commanded the army in Canada, but was forced to retreat on account of the smallness of his force, and the ravages of the small-pox, of which he soon died.

THOMAS, JOSEPH, LL.D., b. N. Y., 1811; educated at Yale college, and became a physician. He spent the years 1857-58 in India, engaged in the study of the oriental languages, and afterwards studied in Egypt. He was prof. of Latin and Greek at Haverford college, Penn. In association with Thomas Baldwin he published in 1845 *A Pronouncing Gazetteer*, which went through several editions and has been several times revised; and in 1854, *A New and Complete Gazetteer of the United States*. Among his other works are, *Travels in Egypt and Palestine* (1853); *A Comprehensive Medical Dictionary* (1864), and a *Universal Pronouncing Dictionary of Biography and Mythology* (1871). *Webster's Unabridged Dictionary* is supplied with his "pronouncing vocabularies" of proper names, in which department his work has high authority. D. 1891.

THOMAS, THEODORE, b. Germany, 1835; received his musical education from his father, and played the violin at public concerts when only six years of age. He came with his parents to America in 1845, and was a member of the orchestra of the Italian opera in New York. He played first violin in the first American concert tour of Jenny Lind. In 1861 he began the formation of his famous orchestra, and in 1864 gave his first symphony concerts in New York. In 1866 he instituted his summer-night festivals. In 1869 he conceived the idea of traveling during the time unoccupied in New York, and for nine years he made an annual round of the principal American cities, which enabled other places to enjoy the services of his unrivaled orchestra. In 1878 he accepted the position of director of the college of music at Cincinnati, but disagreements arose, and in the spring of 1880 he resigned his position to return to New York. From 1878 to 1890 he was the conductor of the Brooklyn philharmonic society, and in 1890 he went to Chicago. He visited N. Y. city with his orchestra in 1895 and 1897.

THOMAS, THEODORE GAILLARD, b. S. C., 1832; took his medical degree at the South Carolina medical college. In 1863 he was chosen prof. of obstetrics and gynecology at the College of Physicians and Surgeons in New York city, and acted as visiting surgeon at the city hospitals. He has written many papers for medical periodicals, and is the author of a standard treatise on the diseases of women, which has been translated into French and German. As a medical lecturer he is admirably clear and instructive.

THOMASIVS, CHRISTIAN, a German philosopher and jurist, was born at Leipsic, Jan. 1, 1655; studied at Frankfort-on-the-Oder (1675-79), and, returning to his native town, commenced to lecture on law in a style perfectly free from the pedantry of the schools. In 1687, to the astonishment of his Latin-speaking colleagues, he adopted the German language as the vehicle of his expositions, published his programme for the following year in the same tongue, and commenced a monthly journal under the very German title of *Freimüthige, Lustige und Ernsthafte, jedoch Vernunft- und Gesetzmässige Gedanken oder Monatsgespräche über Allerhand, Vornehmlich aber neue Bücher* (Honest, Merry, Sincere, yet Rational and Moderate Thoughts, or Monthly Talk concerning all Sorts of Books, but especially New Ones). This work, however, excited so much opposition that he was forced to leave Leipsic, and went first to Berlin, and afterward (1690) to Halle, where, under the patronage of the Brandenburg court, his lectures were the means of establishing a university, since famous. In this university Thomasius became professor of jurisprudence, and here he died, Sept. 23, 1728. The great aim of Thomasius was to harmonize and blend science and life; hence his contempt for hair-splitting subtleties of which nothing could be made; his preference for the use of German rather than Latin in his academic lectures; his disinclination to all philosophical terminology, his depreciation of the school-men, etc. But more particularly he was among the first who insisted on dissociating natural right from morality, and, in connection therewith, honorably signalized himself as a courageous opponent of trial for witchcraft and punishment by torture. The characteristic features of his mode of thought are contained in his *Vernünftige und Christliche aber nicht Scheinheilige Gedanken und Erinnerungen über Allerhand Auserlesene, Gemischte, Philosophische und Juristische Händel* (Rational and Christian, but not pretend-ly Pious Thoughts and Recollections concerning sundry Choice, Mixed, Philosophical, and Juristic Transactions, 3 vols. Halle, 1723-26); and in his *Geschichte der Weisheit und Thorheit* (History of Wisdom and Folly).—See Luden, *Christian Thomasius nach seinen Schicksalen und Schriften* (Berl. 1805).

THOMAS, ST., the island. See SAINT THOMAS.

THOMAS THE RHYMER, a name given to the earliest poet of Scotland. The history of his life and writings is involved in much obscurity; but it is generally believed that Thomas Learmount of Ercildoune was the person whose poems and prophecies were extensively known among the people of Scotland at an early period. The rhymer derived his territorial appellation from the village of Ercildoune, in the county of Berwick, situated on the river Leader, about 2 m. above its junction with the Tweed. The time of his birth is unknown; but he appears to have reached the height of his reputation in 1283, when he is said to have predicted the death of Alexander III., king of Scotland. This singular prophecy is recorded in the *Scotichronicon* of Fordun in 1430, who relates

that one day the rhymer, when visiting at the castle of Dunbar, was interrogated by the earl of March, in a jocular manner, if to-morrow should produce any remarkable event. The rhymer is reported to have expressed himself to the effect: "Alas for to-morrow, a day of calamity and misery! Before the twelfth hour shall be heard a blast so vehement that it shall exceed all those which have yet been heard in Scotland—a blast which shall strike the nations with amazement, shall confound those who hear it, shall humble what is lofty, and what is unbending shall level with the ground." On the following day the earl, who had been unable to discover any unusual appearance in the weather, when seating himself at table observed the hand of the dial to point to the hour of noon; while, at the same moment, a messenger appeared bringing the mournful tidings of the accidental death of Alexander at Kingorn. This is supposed to have been before 1299.

From this and other prophecies the rhymer became popularly known as "true Thomas," and was believed to have derived his skill from his intercourse with the queen of fairyland. The legend bears that he was carried off at an early age to fairyland, where he acquired all the knowledge which made him so famous. After seven years' residence there he was permitted to return to the earth to enlighten and astonish his countrymen by his prophetic powers, still remaining bound to return to his royal mistress when she should intimate her pleasure. Accordingly, while the rhymer was making merry with his friends in his tower at Ercildoune, a person came running in, and told, with marks of fear and astonishment, that a hart and hind had left the neighboring forest, and were composedly and slowly parading the street of the village. The rhymer instantly rose, left his habitation, and followed the animals to the forests, whence he was never seen to return. The Eildon tree, where he delivered his prophecies, no longer exists; but its site is marked by a large stone called the Eildon tree stone. A neighboring rivulet takes the name of the Bogle (or goblin) burn from the rhymer's supernatural visitants.

The earliest edition of the prophecies of the rhymer was published in Edinburgh, by Waldegrave, in 1603. See also, *The Romance and Prophecies of Thomas of Ercildoune*, by J. A. H. Murray, LL.D. (1876).

THOMASTON, a town and village in Litchfield co., Conn.; on the Naugatuck river, and the New York, New Haven, and Hartford railroad; 10 miles n. of Waterbury. They contain a high school, Laura Andrews public library, national and savings banks, electric lights, and extensive manufactories of clocks, watches, cyclometers, cutlery, brass goods, clock bells, and enamel goods. Pop. '90, 3278.

THOMASTON, a town and village in Knox co., Me.; on the Georges river and the Maine Central railroad; 4 miles w. of Rockland. They contain the state prison, high school, electric light and street railroad plants, national and savings banks, ladies' and prison libraries, and extensive lime works and shipbuilding plants. Pop. '90, 3009.

THOMASVILLE, city and co. seat of Thomas co., Ga.; on the Plant system of railroads; 32 miles n.e. of Tallahassee, Fla. It is 50 miles from the Gulf of Mexico, has an altitude of 350 feet above sea-level, and contains the South Georgia college (co-educational), Young female college, the Connecticut industrial school for colored pupils, gas and electric light plants, waterworks supplied from artesian wells, national and state banks, and several large hotels. The city is a noted winter health resort for northern invalids. Pop. '90, 5514.

THOMPSON, a town in Windham co., Conn.; on the Quinebaug river, and the New England railroad; 26 miles n.e. of Norwich. It was incorporated in 1785, contains several villages, and has electric lights, good water-power, cotton and woolen mills, and many handsome residences on the surrounding hills. Pop. '90, 5580.

THOMPSON, AUGUSTUS CHARLES, D.D., b. Conn., 1812; educated at Yale college, East Windsor theological seminary, and the university of Berlin; became pastor of the Eliot Congregational church, Roxbury, Mass., 1842. He visited India with Dr. Anderson, 1855-56. His publications are: *Songs in the Night*; *The Lambs Fed*; *The Young Martyrs*; *Last Hours, or Words and Acts of the Dying*; *The Better Land*; *The Poor Widow*; *Gathered Lilies, or Little Children in Heaven*; *Feeding the Lambs*; *Morning Hours in Patmos*; *Lyra Cælestis*; *Christus Consolator*; *The Mercy Seat*.

THOMPSON; BENJAMIN. See RUMFORD, Count.

THOMPSON, CEPHAS GIOVANNI, b. Middleboro', Mass., 1809; inherited love of art from his father, a portrait painter; went to reside in Plymouth at the age of 18, and began to paint portraits. He entered the studio of D. C. Johnson in Boston, and had access to the Boston Athenæum. He subsequently removed to Providence, R. I.; resided in New York, 1837-47; in New Bedford, Mass.; in Italy, 1852-60; making one of a circle of young American artists and sculptors since known to fame. Returning to New York he continued work, dying in 1888. Among his best-known works are copies of the Staffa "Madonna" of Raphael, and "Beatrice Cenci;" among his own conceptions are the "Angel of Truth," "Liberation of St. Peter," "The Mother's Prayer," "Chastity," etc. His brother Jerome, 1814-86, was a landscape painter.

THOMPSON, DANIEL PIERCE, 1793-1868; b. Mass.; graduated at Middlebury college, 1820; became a private tutor in Virginia; studied law and was admitted to the bar of that state. He returned to Vermont, 1824, practiced in Montpelier, and held several legal offices. In 1853 he became secretary of the state. He wrote seven or eight novels,

of which *The Green Mountain Boys* (1840), and *The Rangers* (1850), were very popular. He also wrote a history of Montpelier (1860); and *Laus of Vermont* (1835).

THOMPSON, DENMAN, actor, was born in Girard, Erie co., Penn., in 1833. His parents were both natives of New Hampshire, whither they removed in 1847, and where Denman attended school until 1850, when he went to Boston, to earn his own living. He soon joined a circus company, with which he remained some time, and subsequently engaged in many other ventures of a similar nature, with varied success until 1875, when he won a deservedly wide reputation by creating the character of Joshua Whitcomb in the play of that name. In 1886 he produced *The Old Homestead* at the Boston theatre, in which his previous success was emphasized and confirmed. This play had a continuous run of four years 1887-91 and was often reproduced after that time.

THOMPSON, SIR EDWARD MAUNDE, F.S.A., curator and editor, Hon. LL.D. from St. Andrews college, Scotland, was b. May 4, 1840, in Jamaica, W. I., and was educated at Rugby, Eng. In May, 1861, he was appointed assistant in the British Museum; in 1878 became keeper of the MSS. in the Museum. He was Sandars reader in Bibliography at Cambridge (1895-96), and was knighted in 1895. He has edited: *Chronicon Anglie*, 1328-1388, in the Rolls Series (1874); *Letters of Humphrey Prideaux* for the Camden Society (1875); *Chronicon Ade de Usk*, 1377-1404 for the Royal Society of Literature (1876); *Correspondence of the Family of Hatton*, for the Camden Society (1878); *Diary of Richard Cocks in Japan*, 1615-1622, for the Hakluyt Society (1883); and, jointly with Professor Jebb, the facsimile of the "Laurentian Sophocles" for the Hellenic Society (1885). He is also joint editor of the publications of the London Paleographical Society.

THOMPSON, ELIZABETH, b. England, about 1850; studied art, and in 1874 exhibited at the Royal academy, London, a painting called "The Roll-Call," the most successful picture of the year. This was afterwards purchased by the queen. She married maj-gen. sir W. F. Butler in 1877. With the exception of a "Vintage Sketch in Tuscany," her other works are from military subjects, the "Battle of Balaklava" being the most important. She has exhibited also "Floreat Etona" (1882); "Evicted" (1890); "The Camel Corps" (1891); "The Dawn of Waterloo" (1895).

THOMPSON, GEORGE, 1804-78; b. and d. England. He first became known in connection with the anti-slavery agitation in the British colonies and was largely instrumental in procuring the freedom of the slaves and the abolition of the apprenticeship system. Subsequently he had joined the Anti-Corn Law league, and also took an active part in forming the British India assoc., which procured better government for the people of India. He was associated with Garrison, Whittier, and others in the anti-slavery movement in the U. S. A visit which he paid to this country, 1834, led to the formation of upward of 150 anti-slavery societies. Obligated to flee from this country on account of threats against his life, he returned during the civil war, and was given a public reception by the house of representatives. He belonged to the National Parliamentary Reform assoc. of England, and was elected M. P., 1847.

THOMPSON, Sir HENRY, surgeon, b. in Framlingham, Suffolk, England, in 1820, was educated at University college, London, Eng., and was appointed assistant surgeon of the University College hospital, London, in 1856; surgeon of the same in 1863; its professor of clinical surgery in 1866, and consulting surgeon in 1874. In 1884 he was professor of surgery and pathology in the royal college of surgeons, London. His essays on *The Pathology and Treatment of Stricture of the Urethra*, and *The Healthy and Morbid Anatomy of the Prostate Gland*, together with his *Clinical Lectures*, and his *Practical Lithotomy and Lithotomy*, have gone through numerous English editions and have been translated into the chief European languages. In 1864 he became surgeon extraordinary to Leopold I., King of the Belgians, and in 1866, to his successor, Leopold II. He has received various honors abroad, and in 1867 was knighted at home. He has written for current English magazines upon various subjects, and is understood to have been the author of two novels published under the pseudonym of "Pen Oliver." He has studied painting, and frequently exhibited pictures at the Royal Academy (London), the Salon (Paris), and elsewhere. He first brought the question of cremating dead human bodies before the English public, and in 1874 started the Cremation Society of London.

THOMPSON, HUGH MILLER, D.D., b. Londonderry, Ireland, 1830, graduated at Nashotah House, Wis.; was ordained priest in the Prot. Epis. church, 1856; had charge of many parishes and missions in the west and south; was prof. of ecclesiastical history at Nashotah House, and founded the sem. of Kemper Hall at Kenosha, Wis., where he also held a pastorate. He was for a while editor of the *American Churchman*, and at his entering upon the rectorship of Christ church, New York, 1872, he took editorial charge of the *Church Journal and Gospel Messenger*. He was consecrated asst. bp. of Miss., 1883. He is the author of *Unity and Its Restoration*, *Sin and Penalty*, *Is Romanism the Best Religion for the Republic?* etc.

THOMPSON, HUGH SMITH, b. Charleston, S. Car., 1836; educated at the South Carolina military acad.; was prof. in that institution, 1858-65; principal Columbia acad., 1865-80, and state supt. of education, 1871-82. He was elected gov. of S. Car., 1882, Dec.; re-elected, 1884, Dec.

THOMPSON, JACOB, b. N. C., 1810; graduate of the university of North Carolina, 1831; studied law; admitted to the bar, 1834; a Miss. pioneer; settled in the Chickasaw country; member of congress, 1839-51 chairman of the committee on Indian affairs. A zealous defender of his state and a strong partisan, he worked indefatigably for the interests of the Democratic party; was appointed secretary of the interior, 1857; holding the office 4 years; resigning for reasons connected with the re-enforcement of fort Sumter. He was one of the commissioners from the state of Miss. to North Carolina to urge the adoption of an ordinance of secession; gov. of Miss., 1862-64. In the civil war he was inspector-gen., department of the Mississippi, and aid to Beauregard. D. 1885.

THOMPSON, JOHN R., 1823-73; b. Conn.; graduated at the university of Virginia, 1843; studied law, and in 1845 was admitted to the bar. He is best known as the editor of the *Southern Literary Messenger*, which he controlled, 1847-61. Near the end of the war he went to England and wrote articles in defense of the cause of the confederacy in *Blackwood's Magazine*, the *Cornhill*, and other periodicals. He afterward resided in New York, and was a contributor to the *Evening Post*.

THOMPSON, JOSEPH PARRISH, D.D., LL.D., 1819-79; b. Philadelphia; graduated at Yale college 1838; studied theology at Andover and New Haven; ordained pastor of Chapel street Congregational church, New Haven, 1840; minister of Broadway Tabernacle church (Cong.), New York, 1845-71. He was one of the originators of the *New Englander* and the *Independent*, and associate editor of the latter. He visited Europe and the east, 1852-54. From 1872 until his death he resided in Berlin. His publications, besides sermons, addresses, and pamphlets, are: *Memoir of Timothy Dwight*; *Lectures to Young Men*; *Hints to Employers*; *Memoir of David Hale*; *Foster on Missions*, with a preliminary essay; *Stray Meditations*; *The Believer's Refuge*; *The Invaluable Possession*; *Egypt, Past and Present*; *The Early Witnesses*; *Memoir of Rev. David T. Stoddard*; *The Christian Graces*; *The College as a Religious Institution*; *Love and Penalty*; *Bryant Gray*; *Christianity and Emancipation*; *The Holy Comforter*; *Man in Genesis and Geology*; *Theology of Christ from His Own Words*; *Home Worship*; *Church and State in the United States*; lectures given in Berlin; *Life of Christ*; *Lectures on The Centennial of American Independence*, at Berlin, Dresden, Florence, Paris, and London; *The Workman, His False Friends and His True Friends*. Dr. Thompson devoted much time to oriental studies, especially Egyptology, the fruits of which have appeared in the *North American Review*, *Bibliotheca Sacra*, *Journal of the American Geographical and Statistical Society*, *Smith's Dictionary of Biblical Geography and Antiquities*; *Kitto's Cyclopædia of Biblical Literature*. Few men in literary and professional life have shown such industry, with uniformity of power in widely varying departments.

THOMPSON, LAUNT, b. Ireland, 1833; came to the U. S. when a boy; studied drawing and modeling in the studios; and in 1858 opened a studio in New York. Among his best-known works are the statues of Sedgwick, of Winfield Scott, and of Napoleon, the soldiers' monument at Pittsfield, Mass., and a statue of Abraham Pierson, first pres. of Yale, now in the college grounds, busts of Edwin Booth, Bryant, General Dix, Stephen H. Tyng, Charles Y. Elliott, and S. F. B. Morse. He died in 1894.

THOMPSON, MAURICE, author and journalist, born at Fairfield, Ind., Sept. 9, 1844. His early life was spent largely in Kentucky and Georgia, and during the civil war he served in the confederate army. At the close of the war he returned to Indiana, settling at Crawfordsville, where he engaged alternately in the practice of law, and in civil engineering, and from 1885 to 1889 was state geologist. In 1890 he entered journalism, joining the editorial staff of the *New York Independent*. His numerous publications include *Hoosier Mosaics* (1875); *The Witchery of Archery* (1878); *A Tallahassee Girl* (1882); *Songs of Fair Weather* (1883); *Byways and Bird Notes* (1885); *Sylvan Secrets* (1887); *The Story of Louisiana* (1888); and *A Fortnight of Folly* (1888).

THOMPSON, RICHARD WIGGINTON, b. Va., 1809; engaged in mercantile pursuits at Louisville, Ky.; studied law, and was admitted to the bar, 1834, in which year he was elected to the Ind. legislature; was re-elected, 1835, and elected to the state senate, 1836. He was sent as a whig to congress, 1841; re-elected, 1847. He practiced law at Terre Haute, Ind., still maintaining an active interest in politics. He was appointed sec. of the navy by Pres. Hayes, 1877.

THOMPSON, ROBERT ELLIS, born in Ireland in 1844, educated at the university of Pennsylvania, became a Presbyterian clergyman in 1882, and professor in the university of Pennsylvania 1870-92, and in 1894 became president of the Central high school of Philadelphia. He has published and edited many books on religious, educational, and economical subjects.

THOMPSON, THOMAS PERRONET, 1783-1869; b. England; graduated at Queen's college, 1802; served three years in the navy and then joined the army. He took part in the Buenos Ayres campaign, 1807; and in 1808 was made governor of Sierra Leone. His recall to England, 1810, was said to be due to the influence of the slave-traders, against whose traffic he had taken active measures. He was with the British army in the Peninsular and French campaigns of 1813 and 1814, and in the Indian Pindaree campaign. He was afterwards engaged in negotiations for the suppression of the slave trade by treaty. In 1824 he was one of the founders of the *Westminster Review*, and contributed many papers on a wide range of topics. He was a member of parliament, 1835-57.

THOMPSON, WADDY, 1708-1868; b. S. C.; son of Judge Waddy; graduate of South Carolina college, 1814; admitted to the bar, 1819; member of the S. C. legislature, 1826-30. He was at one time solicitor for the w. circuit; brig.-gen. of state militia; member of congress, 1835-41. He was chairman of the committee on military affairs, 1840; minister to Mexico, 1842, when his diplomatic services accomplished the release of 200 Texan prisoners. Subsequently he became a cotton planter in Florida, but resided in South Carolina. He published *Recollections of Mexico* (1846).

THOMPSON, WILLIAM, 1725-81; b. Ireland; settled in Pennsylvania, and was a capt. in the militia of that state in the French war, 1759-60. He led a regiment of Pennsylvania riflemen to Cambridge, in 1775, and skirmished with the British at Lechmere point soon after his arrival. Made a brig.-gen. in 1776, he was Lee's successor at New York, and soon afterward joined the army in Canada. Captured at Three Rivers, where he led the attacking force, he remained a prisoner on parole at Philadelphia till 1778.

THOMPSON, WORDSWORTH, historical and *genre* painter, born at Baltimore, Md., May 26, 1840, after studying under Charles Gleyre Lambinet and Passini, he exhibited his first picture "Moorlands of Au Fargi" at the Paris Salon of 1865. A picture called "Desolation" in 1873 brought about his election to the National Academy. Mr. Thompson found his subjects in Spain, Algiers, and Morocco, as well as in this country, but he will be best remembered as the painter of American historical themes, such as "Annapolis in 1776," and "A Review at Philadelphia in 1777." He died at Summit, N. J., Aug. 28, 1896.

THOMPSON, ZADOC, 1796-1856, b. Vt.; educated at the university of Vermont. He took orders in the Episcopal church, and was appointed professor in the Vermont Episcopal institute. He was state geologist, 1845-48, and professor of chemistry and natural history in the university of Vermont, 1851-53. He was a commissioner to the universal exposition in 1851, and was appointed state naturalist in 1853. Among his works are a *Gazetteer of Vermont* (1824); *The History of Vermont, Natural, Civil, and Statistical* (1841-43); and *Geography and Geology of Vermont* (1848).

THOMPSONVILLE, a village in Enfield town, Hartford co., Conn., on the Connecticut river, and the New York, New Haven, and Hartford railroad; 18 miles n. of Hartford. It contains the Enfield high school, and is principally engaged in the manufacture of carpets. Pop. '90, 4673.

THOMS, WILLIAM JOHN, b. Westminster, England, 1803; contributor to the *Foreign Quarterly Review*, and other periodicals, while clerk in the secretary's office of the Chelsea hospital; fellow of the society of antiquarians, 1838, and of similar societies in Edinburgh and Copenhagen; 1838-73, sec. of the Camden society. He was the founder and editor of *Notes and Queries*, retired 1872. He published a *Collection of Early Prose Romances* (1828); *Lays and Legends of Various Nations* (1834); *Three Notelets on Shakespeare* (1865); *Human Longevity* (1873). He d. 1885.

THOMPSON, ANTHONY TODD, 1778-1849; b. Edinburgh; educated at the university of Edinburgh, where he took the degree of M.D. 1799; began practice in London in 1800. He held the professorships of *materia medica* and medical jurisprudence in the London university, 1832-49, and was editor of the *Medical Depository*. He was the author of the *London Dispensatory* (1811), and wrote and edited many medical treatises and papers. His wife, KATHARINE BYERLEY THOMSON, 1800-62, wrote several novels and, jointly with her son, John Cockburn Thomson, published under the names of Grace and Philip Wharton several volumes of memoirs and biographical incidents, such as *Life and Times of George Villiers, Duke of Buckingham*; *Memoirs of Sir Walter Raleigh*, etc.

THOMSON, CHARLES, LL.D.; 1729-1824; b. Ireland; emigrated to America in 1740; was educated in Maryland, and entered business in Philadelphia, where he enjoyed the intimacy of Franklin. He was sec. of the continental congress, 1774-88, and of the U. S. house of representatives, 1788-89. He wrote on Indian affairs, and a *Synopsis of the Four Evangelists* (1815).

THOMSON, Sir CHARLES WYVILLE, 1830-82, a noted biologist, b. at Bonsyde, Scotland, educated at the university of Edinburgh, and in 1850 became lecturer on natural history in the university of Aberdeen. Successively he was professor of natural history at the universities of Cork, Belfast, and Edinburgh. He was one of the directors of the deep-sea dredging expeditions of the "Lightning" (1868) and of the "Porcupine" (1869), and director of the "Challenger" exhibition of 1872 to 1876. He wrote *Depths of the Sea* (1873).

THOMPSON, EDWARD, D.D., LL.D.; 1810-70; b. England; came to America, 1819; studied medicine in Philadelphia and Cincinnati; began practice at Wooster, Ohio, 1829; joined the Methodist conference, 1833, and was a minister at Norwalk, Sandusky, Cincinnati, Wooster, Detroit; president of Norwalk seminary, 1837-44; professor of mental and moral philosophy in university of Michigan, 1843; elected president of Ohio Wesleyan university, 1846; elected bishop, 1864, and soon afterward visited the Methodist missions in Germany, Bulgaria, India, and China, and organized the India mission into an annual conference. He published *Moral and Religious Essays: Biographical and Incidental Sketches; Educational Essays* (1856); *Letters from Europe* (1856); *Letters from India, China, and Turkey* (1870).

THOMSON, JAMES, author of *The Seasons*, was born on Sept. 11, 1700, at Ednam, in Roxburghshire, of which parish his father was minister. He was put to school at Jedburgh, and afterward sent to complete his education at Edinburgh. His intention was to enter the church, and he went through a full course of study with that object in view. His views, however, changed. From a very early age, he had been wont to express himself in verse; and in 1725 he betook himself to London to seek fame and fortune as a poet. Almost his sole capital for the enterprise seems to have been his manuscript poem of *Winter*. This, with some little delay and difficulty, he disposed of to a publisher for three guineas; and as its success was not instant, his outlook was by no means brilliant. Gradually, however, the merits of the poem were recognized; successive editions were called for; friends and patrons were not wanting to the young author, and in no long time Thomson found himself as good as a made man and poet. The *Winter* was followed in 1727 by the poem *Summer*; *Spring* was published the year after; and *Autumn*, completing *The Seasons*, appeared in 1730, with a re-issue of the previous portions. In 1729, Thomson produced the tragedy of *Sophonisba*; but though great expectations were formed of it, its success on the stage was but indifferent. During 1730-33, Thomson was abroad in Paris and elsewhere with the son of Sir Charles Talbot, the chancellor; and on his return, at the death of his pupil, the comfortable place was bestowed upon him of secretary of the briefs. This he held till it lapsed, on the death of the chancellor in 1737, which left him once more in considerable straits, which were, however, a little alleviated by a pension of £100 a year given him by the prince of Wales. His tragedy of *Agamemnon*, produced in 1738, was in Johnson's phrase, "only endured, but not favored;" and his poem on *Liberty*, by himself considered his greatest work, was little relished by the public. His *Tancred and Sigismunda*, produced in 1745, was the only one of his tragedies which had any success, and its success was not of a signal kind. About this time, the accession to power of his friend Mr. Lyttleton secured him the office of surveyor-general of the Leeward islands, which, however, he did not long live to enjoy. He died of a neglected cold in Aug., 1748, and was buried in the church of Richmond, without an inscription; but a monument was afterward erected to his memory in Westminster abbey. In the spring before his death he had published his finest poem, *The Castle of Indolence*. This piece which is written in the Spenserian stanza, has all the descriptive power and opulence of imagination which distinguish his more popular *Seasons*, while in tone and diction it is much more chastened and harmonious. Of his other works, with the exception of the song of *Rule Britannia*, nothing but the names is now remembered. As a man, Thomson was singularly amiable, and his careless, indolent generosity of disposition seems to have endeared him to all who knew him.

THOMSON, SAMUEL, 1769-1843; was the author of a *Materia Medica and Family Physician, New Guide to Health*, and *Life and Medical Discoveries, written by himself* (Boston, 1825), and originated the "Thomsonian," or botanic system of medical practice.

THOMSON, THOMAS, 1768-1852; b. Ayrshire, Scotland; educated at the university of Glasgow, called to the bar in 1793; deputy-clerk-registrar of Scotland, 1806; principal clerk of sessions, 1828-52. In 1832 he was elected president of the Ballantyne Club. He was one of the founders of the *Edinburgh Review*, and occasionally a substitute for Jeffreys as editor. He superintended the publication of numerous works on historical, legal, biographical, and other subjects; among them Chambers's and Thomson's biographical dictionary of eminent Scots, 1855. Sir Walter Scott, who acknowledged himself his debtor, asserted that he understood more of old books, old laws, and old history than any other man in Scotland.

THOMSON, THOMAS, 1773-1852, b. Scotland; educated at St. Andrew's and Edinburgh. In 1796 he began to contribute to the *Encyclopædia Britannica* a series of articles on chemical subjects, afterward published a *System of Chemistry*, 4 vols., 1802. In 1817 he was appointed lecturer on Chemistry, and in 1818 prof. at the university of Glasgow. He was among the first to explain Dalton's atomic theory and to recommend the employment of chemical symbols. Among his works are *Elements of Chemistry* (1810); *Travels in Sweden* (1813); *History of Chemistry* (1830-31); *Outlines of Mineralogy and Geology* (1836); and *Brewing and Distillation* (1849).

THOMSON, WILLIAM, D.D., b. England, 1819; educated at Oxford, of which he was tutor, fellow and provost; ordained, 1842; select preacher at Oxford, 1846; Bampton lecturer, 1853; rector of All Souls, Marylebone, 1855; preacher of Lincoln's Inn, 1853; bishop of Gloucester and Bristol, 1861; archbishop of York, 1863. He was a member of several learned societies, president of the Palestine exploration fund, one of the lords of the privy council, governor of the Charter-house and of King's college. Dr. T. published *The Atoning Work of Christ*; *Outline of the Necessary Laws of Thought*; *Life in the Light of God's Word*; *Limits of Philosophical Inquiry*. He died in 1890.

THOMSON, Sir WILLIAM, one of the few very great living mathematicians and natural philosophers, was b. in June, 1824. His father was prof. of mathematics in the university of Glasgow. Thomson graduated in 1845, as second wrangler and first Smith's Prizeman at Cambridge, where he was shortly afterward elected to a fellowship in St. Peter's college; and became prof. of natural philosophy in the university of Glasgow in 1846. This appointment he still holds. While still an undergraduate, he published several valuable papers. He was for some time editor of the *Cambridge Mathematical Journal*, and some of his most brilliant discoveries have appeared in its pages. He has

also contributed to the *Comptes Rendus*, the transactions and proceedings of the royal societies of London and Edinburgh, and various other journals. All his numerous writings have the stamp of originality in a marked degree. In the mathematical theories of elasticity, vortex-motion, heat, electricity, and magnetism, he has made remarkable discoveries; among which we need merely mention the dissipation of energy, the beautiful idea of electric images, and the complete solution of the problem of telegraphing through a submarine cable. Popularly, he is best known by his association with the Atlantic cable, a gigantic idea, which, but for his investigations, might, perhaps, not have been realized or even attempted. On its successful completion, in 1866, he was knighted. He has invented several excellent and useful instruments for various electrical purposes—such as electrometers and galvanometers; instruments for the determination of electric units in absolute measure, etc. He is a remarkable instance of the combination of the very highest powers of reasoning with the practical skill of the mathematician and engineer. In conjunction with Prof. Tait, he published in 1867 the first volume of a *Treatise on Natural Philosophy*. In 1892 he was made a peer, with the title of Lord Kelvin. He visited the U. S. in 1897.

His elder brother, JAMES, prof. of civil engineering in Glasgow, has made various improvements in the construction of turbines and other engines (see WATER-POWER); but is best known by his splendid discovery that the freezing-point of water is lowered by pressure; and the glacier-theory he has founded upon it. See HEAT, ICE, REGELATION.

THOMSON, WILLIAM M., D.D., graduated at Miami university, 1826; went as a missionary of the American board to Syria and Palestine. He published *The Land and the Book*; *Biblical Illustrations, drawn from the Manners and Customs, the Scenes and the Scenery of the Holy Land*; *The Land of Promise*; and *Travels in Modern Palestine*.

THOMSON EFFECT. If a wire is heated at one spot the heat will extend to equal distances on each side. If a current is passed this equality will be distributed, and the heat will extend further on one side, and not so far on the other.

THOMSONIAN SYSTEM. See THOMSON, SAMUEL.

THOR, the god of thunder, was the son of Odin and Earth (Yörd); his wife was Sif (= sib, friendship, love, and thus of the same import with Freyja). His palace, supported on 540 pillars, was called Thrudwanger; here he received the warriors that had fallen in battle. Thunder was caused by the rolling of his chariot, which was drawn by he-goats. He was in the vigor of youth, had a red beard, and was the strongest of all gods and men; the gods even called in his assistance when they were in straits. He was, in particular, a terror to the giants (q.v.), with whom he was perpetually at strife, and whom he struck down with his hammer Mjolnir (i.e., the smasher or mauler), which had the property of returning to his hand after being hurled; it had been made by cunning dwarfs. The sign of the hammer was among the heathen Teutons analogous to that of the cross among Christians. In the contest at the twilight of the gods, Thor slew the serpent of Midgard, but fell at the same time poisoned by the venom exhaled from its mouth. The name of Thor was widespread. The Saxons worshiped him as Thunar (high-German, *Donar*). Torden, the wrathful deity dreaded by the Lapps, who in his rage hurled down huge blocks from rocks, tore up trees, destroyed cattle and men, is evidently the Scandinavian Thor. The Gallic god Tarannis—in an old inscription Tanarus—mentioned by Lucan, appears also to be identical, especially as *torunn* in the Celtic languages still signifies thunder. The attribute of thunder is intimately associated with the Latin Jupiter and the Greek Zeus (see also INDRA). Of all the Asa-gods, Thor had unquestionably the most worshipers. In Upsala, according to Adam of Bremen, he occupied the place of honor in the temple between Odin and Frikke. In Norway, Thor was the national god, and here, as in Iceland, temples were almost exclusively erected to him. Offerings were made to him, particularly in times of pestilence. On the ground of the superior respect enjoyed by Thor, and of his being called "old Thor," some place him in opposition to Odin, and consider him historically as an older divinity, only partly supplanted by the Odin doctrine. As rude force is the predominating element in Thor, the humorous element of the Scandinavian belief attaches to him. Thus, the giants often blinded him by magic, and made fun of him; yet he always shows his extraordinary strength in these cases, and in the long-run his opponents are invariably overcome by the hammer. Thursday is so called from Thor; and the name survives in numerous names of places.

THORACIC DUCT, a canal equal in diameter to a goose-quill, proceeding from the *receptaculum chyli* (into which the contents of the lacteals are collected, and which is situated in the front of the body of the second lumbar vertebra), ascends along the front of the vertebral column, between the aorta and ascending vena cava, as high as the fourth dorsal vertebra; it then inclines to the left, and passing behind the arch of the aorta, ascends as high as the seventh cervical vertebra, when it bends forward and downward, and terminates at the point of union of the subclavian and internal jugular veins of the left side, where it is provided with a pair of semilunar valves, which prevent the admission of venous blood into it. It is also provided with other valves on its upward course. This duct is not liable to any special diseases; but if its function of conveying chyle from its source into the general circulation be interfered with, as, for example, by the pressure of a tumor, the due nutrition of the system must be checked.

THORAX. See CHEST.

THORBURN, GRANT, 1773-1863; b. Scotland; a nail-maker who emigrated to New York for political reasons in 1794, and became a seedsman. Over the pseudonym "Lawrie Todd" he was a frequent contributor to periodical literature. Among his works are, *Forty Years' Residence in America* (1834); and *Fifty Years' Reminiscences of New York* (1845). John Galt's novel, *Lawrie Todd*, gives some account of him.

THOREAU, HENRY DAVID, 1817-62; b. Mass.; graduated, 1837, at Harvard; and for three years was engaged in school-teaching. He had considerable mechanical skill, and worked for his bare living at carpentering, surveying, etc., on a system of his own, which opposed devoting more time to such employment than was necessary for the procuring of the necessaries of life. This was, in his case, to enable him to pass as much of his life as was possible in study and contemplation; and he devoted most of his time to investigating nature, and reasoning out metaphysical theories and problems. He was an admirer of Homer, early English literature, and Orientalia. His observations of natural phenomena and animal life made him at last an authority on these subjects, though not in the character of a scientist. He was a minute observer of details, and had a most vivid appreciation of facts and incidents in the line of his studies. He never married; was somewhat eccentric in his habits and opinions; a vegetarian by preference; and humane to that degree that he never used a gun to aid him in obtaining specimens of natural history. He contributed infrequently to the *Dial* and other periodicals. In 1849 he produced his first published work, *A Week on the Concord and Merrimac Rivers*. This was a detailed account of a boat-voyage; and was succeeded in 1854 by his *Walden, or Life in the Woods*; mainly devoted to studies of insect, bird, and animal life. Others of his works are *Excursions in Field and Forest* (1863); *The Maine Woods* (1864); *Cape Cod* (1865), etc.

THORIUM, or **THORIUM** (sym. Th, equivalent new system, 231.8), is a rare metal, much resembling aluminum, but taking fire considerably below a red heat, and burning with great brilliancy. *Thorina*, or *thoria*, is supposed to be the dioxide, ThO₂, and is remarkable for its high specific gravity, 9.2. Thorium was discovered in 1829 by Berzelius in an earth to which he had given the name *thorina*, and which occurs in a rare black Norwegian mineral termed *thorite*. None of the compounds of this metal are of any practical importance.

THORN. See CRATÆGUS, HAWTHORN, and SPINE.

THORN (Pol. *Torún*), a strongly-fortified t. of Prussia, in the s. of the province of West Prussia, on the right bank of the Vistula, 31 m. e.s.e. of Bromberg by railway. The town was founded in 1232, was a member of the Hanseatic league, and contains many houses—as the town-hall—remarkable for their beautiful gables and interiors. It is the birthplace of Copernicus, whose monument is to be seen in the *Johannis-Kirche*, and a bronze statue to whom was erected in the market-place in 1853. An active trade in corn and timber is carried on. Pop. '95, 30,306.

THORN, CONFERENCE OF, one of those efforts to explain away the differences between the several bodies of Christians, with a view to religious reunion, of which the 17th c. furnishes more than one example. The originator of this movement was the king of Poland, Ladislaus IV., who proposed his project for the consideration of a synod of the bishops of his kingdom held at Warsaw in 1643, and letters were addressed in consequence to all the several religious bodies in Poland, inviting them to send delegates to an assembly to be held at Thorn, for the purpose of the mutual explanation of their doctrines, with a view to the removal of all differences of belief. The conference met in Oct., 1645, and was opened in a spirit of moderation; but it soon lapsed into disputation and controversy, and at length broke up without any result, Nov. 21, 1645. The official account of the proceedings of the conference are printed in Calvi's *Historia Syncretistica*.—See also Schröckh's *Kirchengeschichte seit der Reformation*, iv. p. 509.

THORN-APPLE, *Datura*, a genus of plants of the natural order *solanaceæ*, having a tubular 5-cleft calyx, a large funnel-shaped 5-lobed flower, a 2-laminated stigma, and an imperfectly 4-celled, prickly, or unarmed capsule. The species of this genus are annual herbaceous plants, rarely shrubs or trees; and are in general very narcotic, and productive of excitement or delirium. The common THORN-APPLE, or STRAMONIUM (*D. stramonium*), is an annual plant, with smooth stem and leaves, white flowers, and erect prickly capsules, a native of the East Indies, brought by the gypsies to Europe, where it is now very generally to be met with, as also in Asia, the n. of Africa, and North America. It is by some stated to be the plant from which the poisonous "dri" of the gypsies is obtained. It contains a peculiar narcotic alkaloid, *D. daturine*, and is one of the most powerful narcotic acrid poisons; but its leaves and seeds are employed, although rarely, in medicine. The leaves have an extremely nauseous overpowering smell, and a loathsome bitter taste; the seeds, which are of a dark-brown color, are still more poisonous. A variety with pale violet flowers and purplish violet stem is frequently cultivated in gardens as an ornamental plant. Still more narcotic is the soft-haired thorn-apple (*D. metel*), a native of the s. of Asia and of Africa. Robbers in India employ it in order to stupefy those whom they would rob, or rather to throw them into the condition of a waking dream. From its seeds, along with opium, hemp, and certain spices, a strong

intoxicating substance is prepared, which the Mohammedans of India use in order to produce in themselves an indescribable joyfulness and extremely pleasurable feeling for a short time; but the use of it destroys the constitution. *D. tatula*, another Indian species, has similar properties, and is very energetic; as is also *D. sanguinea*, the FLORIPONDIO of Peru, which is used by the Indians to prepare a very powerful narcotic drink, which stupefies when very diluted, and when strong, brings on maniacal excitement.—The beautiful *D. fastuosa* has flowers externally of a violet color, and white within, and is cultivated as an ornamental plant, especially a variety with what are called double flowers, which consist rather of two corollas, one within the other.—*D. arborea*, a native of Peru and Colombia, has begun to be also very generally cultivated in flower-gardens in Europe. It has very splendid pendulous white flowers, 9 to 12 in long, which diffuse a sweet smell in the evening and at night. See illus., FLOWERS, vol. VI.

THORNDIKE, ISRAEL, 1757–1832; b. Mass.; received a common education, and in 1776 was made capt. of the *Warren*, a privateer. He assisted in framing the Federal constitution, became a resident of Boston in 1810, and purchased and gave to Harvard university in 1818, the library of Prof. Ebling of Hamburg.

THORNTON, SIR EDWARD, b. England, 1817; educated for the diplomatic service, which he entered by appointment as attaché to the embassy at Turin in 1842. He filled the same position in Mexico (paid) in 1845, and was made secretary to the legation in that capital in 1851. During 1848 he did much to forward the conclusion of the important treaty of Guadalupe Hidalgo. In 1852 he was secretary of legation to Buenos Ayres; chargé d'affaires to Uruguay, 1854; minister to the Argentine republic in 1859; envoy to Brazil in 1865; an envoy to the United States in 1867–82. He was minister plenipotentiary to the emperor of Russia (1881), and ambassador at Constantinople (1884). He was a member of the commission on the Alabama claims in 1871; knighted Aug. 9, 1870.

THORNTON, JOHN WINGATE, b. Maine, 1818; graduated at the Harvard law school, 1840. Mr. Thornton has written a number of historical and biographical pamphlets and books, such as the lives of John Eliot, and John Bowles, *First Records of American Colonization*, etc. He was the founder of the New England historical and genealogical society. He d. 1878.

THORNTON, MATTHEW, b. 1714–1803; b. Ireland, came to America in 1717, was educated at Worcester, Mass., and served as surgeon under William Pepperell in the capture of Louisburg, 1745. He settled as a physician in Londonderry, N. H., and was chosen president of the governmental convention in 1775. He became a delegate to the Continental congress, 1776, and signed the declaration of independence. He was afterward chief justice of Hillborough co., N. H., and later judge of the supreme court.

THORNWELL, JAMES HENLEY, D.D., LL.D., 1812–62; b. S. C.; graduated South Carolina college, Columbia, 1831; studied and taught; pastor of a Presbyterian church, Lancaster, S. C., 1835; professor of logic and belles-lettres in South Carolina college, 1838; pastor of Presbyterian church, Columbia, 1840; chaplain and professor of sacred literature and the evidences of Christianity in the college, 1841; pastor of Globe st. church, Charleston, 1851; president of South Carolina college, 1852; professor of didactic and polemic theology in the theological seminary, Columbia, 1856, and also pastor of the First Presbyterian church. He published *Arguments of Romanists Discussed and Refuted*; *Discourses on Truth*; *On the Rights and Duties of Masters*; *The State of the Country*. He published many controversial articles in the *Southern Presbyterian Review*, and defended slavery and secession. His complete works have been published by the Rev. J. D. Adger. In the southern states he was esteemed as one of the greatest of preachers and theologians.

THORNYCROFT, JOHN ISAAC, English builder of torpedo boats, and eldest son of Thomas and Mary Thornycroft, b. at Rome, Italy, Feb. 1, 1843, was trained in mechanics at an early age, by his father, who constructed a locomotive upon which his children rode around his studio. The cylinders of that locomotive were afterwards employed by the son in the making of a model steamer, which embodied some of the most important elements of the torpedo boat. Later he built a small steam launch, *The Nautilus*, the first upon the river Thames that developed sufficient speed to keep up with racing crews. He designed the *The Ariel*, a fast steamboat, in 1863. That was succeeded by *The Miranda*, which may be considered the progenitor of all torpedo boats now in use. *The Gitana*, built after *The Miranda*, came still nearer, however, to perfection, especially in its closed stokeholes, and the fan by which air was passed through the fire upon the vessel. Continuing his theoretical and practical studies of naval engineering at various English ship-yards, he finally settled at Chiswick, Middlesex County, England, as a maker of torpedo boats, in which specialty he stands in the front rank of all competitors.

THORNYCROFT, MARY (FRANCIS), b. Norfolk, England, 1814; the daughter of John Francis, the sculptor. While still a child she began to acquire the art of modeling, and her first attempts at sculpture were "Penelope" and "Ulysses and his Dog." Her first work of real value was the "Flower Girl." Others of her best works were "Sappho," "A Sleeping Child," and the "Skipping Girl," the best exhibited in the Paris exhibition

of 1855. By queen Victoria, Mrs. Thornycroft was commissioned in 1843 to execute a statue of the princess Alice, and this proved so satisfactory that she was chosen also to model the princess royal, the prince of Wales, and prince Alfred. Her son, William Hamo, is a sculptor of note, and her two daughters are artists. She died in 1895.

THORNYCROFT, WILLIAM HAMO, sculptor, A.R.A., b. in London, Eng., March 9, 1850, son of Thomas and Mary Thornycroft. He was brought up in a remote part of Cheshire, and educated at Macclesfield grammar school, and at University College school, London. He began to work in his father's studio at the age of seventeen, and in 1869 he was a student in the schools of the London Royal Academy. He exhibited at the London Academy for the first time in 1871. The same year he studied in Italy. In 1875 he received the biennial gold medal of the Royal Academy for the group "A Warrior bearing a Wounded Youth from the Field of Battle." His "Artemis" was executed in marble for the Duke of Westminster, and was a pronounced success. He was elected A.R.A. in January, 1881, in which year he produced his statue "Teucer," and R.A. in 1888. His more important works since that time have been the statue of "The Mower," 1884; "Memorial to the Poet Gray" at Pembroke college, Cambridge, Eng., and the statue of "The Sower," 1886. In 1885 he executed a bust of Samuel Taylor Coleridge for Westminster Abbey.

THOROLD, ANTHONY WILSON, D.D., b. Hougham, England, 1825; graduated at Queen's coll., Oxford, 1847; was rector of St. Giles-in-the-Fields, London, 1857-68; member of the Schools Inquiry commission, 1864; minister of Curzon chapel, Mayfair, 1868; and was elected on the first school board for London, 1870; became vicar of St. Pancras, Middlesex, and rural dean, 1869; canon residentiary of York, examining chaplain to the abb., and provincial chaplain to the abb. of Canterbury, 1874. He was consecrated bp. of Rochester, 1877. He is the author of *The Presence of Christ and The Yoke of Christ in the Duties and Circumstances of Life*. He died in 1895.

THOROUGH BASS. See FIGURED BASS.

THOROUGHWORT. See BONESET.

THORWALDSEN, BERTEL, one of the greatest of modern sculptors, was born, it is supposed, at Copenhagen, on Nov. 19, 1770. Neither the place nor the day of his birth, however, can be fixed with absolute certainty; and he himself, when casually questioned as to the last, replied with a certain *brusque* felicity: "I don't know; but I arrived at Rome on March 8, 1797;" dating his birth, as it were, from the commencement of his career as an artist. He was the son of a poor ship-carpenter, and his first essays in art were made in the carving of figure-heads in the yard where his father worked. His education was otherwise neglected, so that through life he could but indifferently write or spell; but the genius for art was born with him, and in 1793 he gained the first gold medal for design at the academy of Copenhagen; and along with it the privilege of three years' residence abroad for the purpose of study. Accordingly, in 1796 he sailed for Rome, arriving there as stated above. After long obscure and patient labor, his talent became conspicuous. From the celebrated Canova, in particular, he had early and generous recognition; and shortly, by the model for his great work, "Jason," he secured general admiration. No purchaser could, however, be found for it till, in 1803, just as in hopeless disgust the artist was about to return to Copenhagen, he received from the well-known Thomas Hope an order for its production in marble at a price which might be called munificent. From this time forward, prosperity and fame flowed upon him in full tide. In 1819 he returned to Denmark, taking the overland route, and everywhere on his journey special honor was paid him. His reception in Copenhagen was triumphal, and apartments were assigned him in the palace of Charlottenburg. He remained at home but a year, and at the end of it returned to Rome, where he continued to prosecute his art assiduously, up to 1838, when he left it, intending to pass his remaining years in his native country. Its climate, however, proved no longer suitable to him, and the year 1841 found him once more at Rome. In 1844, having revisited Copenhagen, he died suddenly there in the theater, of disease of the heart, Mar. 24. All the works remaining in his possession he bequeathed to his country, to be preserved in a museum bearing his name, for the maintenance of which he also left the bulk of his fortune, reserving a sufficient provision for Mme. Poulsen, his natural daughter. This magnificent and unique collection is now one of the chief glories of the metropolis of his native country. By his countrymen, he is naturally held in special honor; and their proud verdict, which ranks him the greatest of sculptors since Michael Angelo, is elsewhere more generally acquiesced in than is often the case in such instances of national enthusiasm. Anything like a catalogue of his chief works need not be here attempted. He addicted himself by preference to classical and mythological subjects; but his great works in the cathedral of Copenhagen, "Christ and the twelve Apostles," "St. John preaching in the Wilderness," and the "Procession to Golgotha," sufficiently prove that he was determined to this preference by no incapacity to appreciate and grandly fulfill the demands of the Christian ideal. Of the many busts from his hand of eminent contemporaries, those of Byron and the great Danish poet Oehlenschläger are perhaps the most notable. The life of Thorwaldsen has been written by Hans Christian Andersen, by J. M. Thiele, and by Eugene Plon. English readers may consult a careful abridgment of M. Thiele's work, by the Rev. M. R. Barnard, published in 1855 by Messrs. Chapman & Hall, London; and a translation of M. Plon's *Life* (1874). See illus., SCULPTURE, vol. XIII.

THOTH, also called **TAUT** or **THEUTH**, the Egyptian *Hermes* or *Mercury*, the mythical inventor of the arts and sciences, music and astronomy, and especially of speech and hieroglyphs or letters over which he was supposed to preside. His name, indeed, meant "speech," or "word," and he personified the divine logos, or intellectual power.

THOU, **JACQUES AUGUSTE DE**, or, as his name is frequently written, *Jacobus Augustus Thuanus*, son of *Christophe de Thou*, first president of the *parlement* de Paris, was born in that city, Oct. 8, 1553. He was originally designed for the church, but when old enough to judge for himself, he gave up all thoughts of an ecclesiastical career. In spite of the difficulty presented by a sickly constitution, he pursued both literary and scientific studies with vigor and success. Taking a liking for the writings of *Cujacius*, he took up his residence at Valence in Dauphiné where he attended the lectures of the celebrated jurist. At Valence, he made the acquaintance of *Scaliger*, with whom he maintained an unbroken friendship for the rest of his life. In 1578 he accepted, with reluctance, the office of ecclesiastical counselor of the *parlement* of Paris. A firm adherent of royalty, in 1588 he was made counselor of state to *Henry III.*; and during the rest of the reign of that king, he took a leading part in all public affairs. On the accession of *Henry IV.*, he was made keeper of the royal library. In 1591 he began his great work, the *Historia mei Temporis*, which principally occupied him during the remainder of his life. He took an important part in the arrangement of the edict of Nantes; but with this exception, he seems to have given but little attention to public affairs during the reign of *Henry IV.*; and the death of that monarch, in 1610 may be said completely to have ended his political existence. From 1604, when the first 18 books of the history appeared, the author held the position of first historian of his age. Eighty books appeared during his life; and the remainder, forming in all 138 books, were published in 1620, after the author's death, which took place May 7, 1617.

THOUSAND ISLES, **THE**, probably the greatest collection of small islands in the world; numbering about 1800; situated in an expansion of the *St. Lawrence* river, between Ontario, Can., and Jefferson and *St. Lawrence* counties, N. Y. They have become a favorite resort for summer tourists and residents, on account of their picturesque beauty.

THRACE, anciently the name of an extensive country bounded on the n. by the Danube, on the e. by the Euxine, on the s. by the *Ægean* and Macedonia, and on the w. by Macedonia and Illyria. In prehistorical times, however, the name appears to have denoted the whole of eastern Europe n. of Greece, including both Macedonia and Scythia; so, at least, one is disposed to understand the fable, that *Oceanus* had four daughters—Asia, Libya, Europa, and Thracia. It is, on the whole, very mountainous—whence, perhaps, its name *Thrace*, from *tracheia*, rugged (?)—the principal range being *Hæmus* (mod. *Balkan*, q.v.), from which three lesser chains branch off in a southeasterly direction, the loftiest being *Rhodope*, the summits of which reach an elevation of more than 8,000 feet. The three most important rivers of Thrace are the *Strymon* (mod. *Struma*), which, during the Greek period, formed the boundary between it and Macedonia; the *Nestus* (mod. *Carasu*); and the *Hebrus* (mod. *Maritza*, q.v.), the largest—all of which flow southward from *Hæmus* into the *Ægean* sea. Roughly speaking, ancient Thrace, before the rise of the Macedonian power, comprised the territory now divided by the Turks into the provinces of *Rumili* and *Bulgaria*; but subsequently the Romans made the range of *Hæmus* the northern limit of Thrace, and gave the region between *Hæmus* and the Danube the name of *Moesia* (mod. *Bulgaria*). The climate was considered by the Greeks very severe—even that of *Ænos*, on the shores of the *Ægean*, being described by *Athenæus* as "eight months of cold and four months of winter;" but it is believed that the ancient accounts are much exaggerated, or are only applied to Thrace poetically as the north, though it is not to be denied that, in the mountainous districts, the frost was often intense—as is still the case. The country was marshy, undrained, and overspread with dense damp forests (of fir, oak, chestnut, etc.), which must have considerably lowered the temperature; but large portions, especially in the s. and e., "such as the great plain of *Adrianople* and the land toward the lower course of the rivers *Nestus* and *Hebrus*," were very fertile. The chief products were corn, millet, wine, and hemp. Cattle, sheep, horses, and swine were reared in great numbers. The region between the *Nestus* and the *Strymon* appears to have been infested by lions. *Herodotus* states that they attacked the baggage-camels of *Xerxes* on his march; but if this was anciently the case these formidable animals have long since disappeared. Gold and silver mines were numerous and productive in the same locality, and the acquisition of these was the principal motive for *Philip* of Macedonia's aggressions.

The question has been much discussed, to what race the Thracians belonged, and it cannot be said that it has as yet been satisfactorily settled. It is certain, however, that two different peoples went by this name in early times. It is repeatedly asserted by those writers who treat of the confused medley of tradition and myth which fills up the prehistorical annals of Greece, that a race of "Thracians" inhabited part of the Hellenic peninsula, and had even at one time extended themselves as far as Attica. To these prehistoric Thracians belonged, says *Strabo*, the muses, and the cultivators of ancient music, *Orpheus*, *Musæus*, *Thamyris*, and *Eumolpus*; and the grand argument against confounding them with the Thracians of history is the impossibility of a race so notoriously barbarous as the latter in language and manners, having sprung from the authors of Hellenic literature and art (see *Müller's Hist. of Greek Lit.* p. 26, et seq.). But

whether the prehistoric Thracians were properly Hellenes, or "Pelasgians"—whatever that may mean—is indeterminable.

Passing now to the historic Thracians, whom we find settled in the regions n. and e. of Macedonia, we are again at fault. Of their manners and customs, of their character, and of their later history, we indeed know something; but of their origin and ethnological relations, we cannot be said to know anything. They were not Greeks, for they spoke a language which the latter called barbarous; but if (as Strabo asserts) the Getæ and Daci were branches of the Thracian family, and spoke the same tongue, we may conjecture that, ethnologically, the term "Thracian" denotes a mixed Illyrico-Scythian race; though it is quite impossible, from want of evidence, to substantiate the conjecture. Herodotus, Xenophon, and Strabo are our chief authorities regarding the habits and practices of the people. From them we learn that they bought their wives, and sold their children. Polygamy was general, and when a husband died, his favorite spouse was slain over his grave. Before marriage the Thracian women enjoyed the utmost liberty; after it they were guarded with Turkish rigor. War and robbery were the only honorable occupations of the men. They lived to steal, either from each other or from neighboring peoples. When not fighting or plundering they spent their days in savage idleness, or in quarreling over their cups. Courageous, or rather ferocious, after the fashion of barbarous peoples, they yet lacked the steady valor and endurance of disciplined troops; at all times, their warfare displayed more fierceness and impetuosity than fortitude. Their treachery was probably no greater than that of other barbarians.

The history of Thrace may be sketched in a few words. The Greeks first became acquainted with the inhabitants when they began to plant colonies on the coasts. Of these the principal were Byzantium (675 B.C.), Selymbria, Abdera (560 B.C.), Mesembria, Dicæa, Maronea, Ænus, Cardia, Sestus, Amphipolis, etc.; but their want of union—the fatal weakness of Hellenic civilization—hindered them from acquiring that measure of power to which they might have otherwise aspired, and enabled the Thracian chiefs of the interior to preserve their independence. In 513 B.C., Darius, king of Persia, marched through Thrace on his way to punish the European Scythians, and on his return left Megabazus, with 80,000 men, to subdue the country. In this he partially succeeded, but new disturbances and complications arose between the Persians and Greeks, which resulted (480 B.C.) in the famous expedition of Xerxes, the details of which do not belong to Thracian history. We have only to mention that a consequence of the expulsion of the Persians from Europe was the resumption of liberty and the revival of prosperity among the Greek colonies in Thrace. Shortly before the Peloponnesian war, a native Thracian state—the Odrysian—had attained to great power and eminence under a ruler named Sitalces, who joined the Athenian alliance, but could not, in spite of his resources, prevent the triumph of Sparta in the north as well as in the south. The rise of the Macedonian kingdom, under Philip II. (359 B.C.), destroyed the independence of great part of Thrace. All the region between the Strymon and Nestus was incorporated with Macedonia, and Macedonian garrisons were established further east. Under the government of Lysimachus the subjugation of Thrace became complete. On the fall of the Macedonian kingdom (168 B.C.) it passed into the hands of the Romans, and subsequently shared the vicissitudes of the Roman empire. In 334 A.D. a colony of Sarmatians was planted in Thrace by Constantine, and in 376 another of Goths by permission of Valens. In 395 it was overrun by Alaric, and in 447 by Attila. In 1353 Amurath obtained possession of all its fortresses, except Constantinople, and it has ever since remained subject to Turkey. But see BALKAN PENINSULA; BULGARIA.

THRALE, MRS. See PIOZZI, MRS.

THRASHER, a name given in the United States to several species of thrushes. They have generally a rather long decurved bill, not notched near the tip; short concave wings, although in some the wings are longer than the tail. In others the wings are decidedly shorter. Color, brown or ash above, usually spotted on the breast. Their names are sage thrasher, or mountain mocker, *oreoscoptes montanus*; brown thrasher, *harporhynchus rufus*; Cape St. Lucas thrasher, *H. cinereus*; gray curve-bill thrasher, *H. curvirostris*; California thrasher, *H. redivivus*; and red-vented thrasher, *H. crissalis*.

THRASIMENE, LAKE. See TRASIMENUS LACUS.

THRASYBULUS, d. B.C. 390; b. Athens, commanded an Athenian galley at Samos in 411. Attaching himself to the opponents of the oligarchy of 400, he was made gen., and secured the recall of Alcibiades. He won the battle of Cynossema, and in 407, in command of a fleet of 30 vessels compelled the submission of the revolted cities in Thrace. Banished by the 30 tyrants, he took possession, with the aid of a Theban force, of the fortress of Phyle. Occupying the Piræus with 1000 men, he fought the 30, and their successors the 10, and in 403 re-established the democracy. In 395 he commanded a force sent to relieve Thebes against the Spartans. In 390, with a fleet of 40 ships, he protected the Rhodians against Telentias. He was killed near Aspendus, in Cilicia, by the inhabitants, in revenge for some outrage committed by some of his men.

THREAD is an exceedingly small twine made by doubling and twisting several thicknesses of yarn so as to produce a strong and well-rounded line for sewing with, either of cotton, flax, or silk.

THREAD-WORMS. This term is applied by some zoologists to the whole order *nematoda*—a word derived from the Greek, and signifying a thread-like form. Most

writers, however, restrict it to the *oxyuride*, which, in the early part of this work, have been included in the *ascarides* (see *ASCARIS*), but have been arranged in a separate family by Cobbold, who divides them into 10 genera. Only one species, *oxyuris vermicularis* (formerly known as *ascaris vermicularis*), the small thread-worm, infests man, and is the commonest of the intestinal parasites. See illus., *WORMS*, vol. XV.

THREATS, in a legal sense, are that kind of intimidation which has for its object to influence a person in abandoning or surrendering some legal right, or what is equivalent, paying money, to prevent some injury being done to him. When the threats are made by more than two persons the offense usually assumes the form of conspiracy (q. v.). In other cases the usual form of the offense is the sending of a threatening letter—i. e. a letter either anonymous or otherwise—demanding money from the party addressed; otherwise, that he will be murdered, or his house will be burned, or he will be charged with some infamous crime. Whoever sends, or indirectly or directly, with knowledge of the contents, causes to be received, any letter or writing demanding, with menaces, or without any reasonable or probable cause, any property, chattel, money, valuable security, or other valuable thing, is held guilty of felony.

The common law very properly takes notice of the fact that a threat may be used to serve the purpose of a lawbreaker as effectually in many instances as an assault or other act of real violence. Accordingly, it is said that threats to intimidate officers of the peace in the exercise of their public functions constitute a misdemeanor; so "extortion" is held to include the obtaining of property by threats equally with such obtaining by violence. The sending of threatening letters is also indictable in the U. S. It is further said that where a person is induced by threats to commit a crime, the threats and apprehension constitute duress, and excuse him.

THREE KINGS, FEAST OF THE, a famous mediæval festival, identical with Epiphany (q. v.) or twelfth night, and designed to commemorate the visit of the three magi or wise men of the east (transformed by the mingled ignorance and reverence of the middle ages into great kings) to the infant Savior. But the name is more particularly given to a kind of dramatic or spectacular representation of the incidents recorded in the 2d chapter of Matthew—as, the appearance of the wise men in splendid pomp at the court of Herod, the miraculous star, the manger at Bethlehem, the solemn and costly worship of the Babe—which was long very popular. In 1336 a peculiarly gorgeous representation was got up at Milan by the preaching friars.

THREE RIVERS, city and co. seat of St. Maurice co., Quebec, Canada; at the junction of the St. Lawrence and St. Maurice rivers, and on the Grand Trunk and the Canadian Pacific railroads; midway between Montreal and Quebec. It was founded in 1634 by direction of Champlain; is within a short distance from the famous falls of Shawenegan; and has several convents and schools, saw mills, iron foundries and machine shops, shoe factory, branch banks, and several hotels. The principal industries are those connected with the lumber trade. It is one of the oldest cities in the province. Pop. '01, 8334.

THRESHER. See *FOX SHARK*.

THRESHING is the separating of the grain or seeds of plants from the straw or haulm, a process which has been accomplished in different ages and countries by means less or more effective. The first method known to have been practiced was the beating out of the grain from the ears with a stick. An improvement on this method was the practice of the ancient Egyptians and Israelites to spread out the loosened sheaves of grain on a circular piece of hard ground 50 to 100 ft. in diameter, and to drive oxen backward and forward over it, so as to tread the grain out; but as this mode was found to damage a portion of the grain, it was partially superseded in later times by the threshing-sledge (Egypt. *noreg*, cf. Heb. *moreg*), a heavy frame mounted on three rollers, which was dragged over the heaps of sheaves. The use of the stick was, however, retained for threshing the lighter kinds of grain. Similar methods of threshing were employed by the Greeks and Romans, the stick (*fustis*, *baculum*, *pertica*), the treading by men or horses, and the threshing-sledge (*tribulum*) being found in common use among them; but their threshing-sledge, which is still to be seen in operation in Greece, Asia Minor, Georgia, and Syria, differed from the eastern one by having pieces of iron or sharp flints fastened to the lower side, in place of rollers. The primitive implement in northern Europe was the stick, and an improved modification of it, the *flail*, has not yet been completely superseded. The flail consists of two sticks loosely fastened together at one end by stout thongs (*caplins*), one stick (the *hand-staff*) is used as a handle by the workman, and by a circular swing round his head he brings down the other stick (the *swipe*) horizontally on the heads of the loosened sheaves spread out on the barn-floor. In the hands of a good workman this implement is found to perform its work pretty effectively, although slowly.

Various attempts were made to supersede the flail by a machine, but with little success, till 1787, when Andrew Meikle, an ingenious Scotch mechanic, produced a threshing-mill so perfect, that even after having run the gauntlet of nearly a century of improvers, it is essentially the machine of its original inventor. In Meikle's mill the

mode of operation is as follows: The sheaves are loosened and spread out one by one on the feeding-board, with the ears toward the machine; they are then pushed forward till caught between two revolving fluted rollers of cast-iron; and as soon as one sheaf disappears between the rollers, another is presented to them. Behind the rollers is a rapidly revolving *drum* or cylinder, having four *beaters* or spars of wood armed with iron placed along its surface parallel to its axle; and these beaters striking the heads as they are protruded from between the rollers, detach the seeds and husks. Grain and straw then pass together over the cylinder, the former falling through wire-work, while the straw is carried forward by circular rakes, and, being by them thoroughly tossed and separated from the grain and chaff, is then ejected. The grain which has fallen through the wire-work is received into a winnowing-machine, where it is cleansed from chaff, etc., and is then either discharged upon the barn-floor, or, as is the case with the most improved machines, is raised by a series of buckets fixed on an endless web, and again winnowed, to separate the perfect grains from the light and small seeds. Barley is, previous to the second winnowing, subjected to the process of "hummingel," by which the awns are removed; but the rest of the process is the same as above.

Since Meikle's invention, the improvements attempted on his mill have been chiefly confined to modifications of the drum; such as diminishing the distance between the drum and its cover; increasing the number of the beaters, and accelerating the speed of the drum.

The portable threshing-machine, now so generally employed in England and America, has not the two grooved rollers, the loosened sheaf being at once submitted to the action of the threshing-machinery; the drum, which is a *high-speed drum*, is provided with six beaters, and its cover is capable of being set at any required distance from it by means of screws. A modification of this machine has the drum wide enough to allow of the straw being fed in sideways; the cover incloses the machine for about three-fifths of its circumference; and the straw, after separation from the grain, is delivered by the rakes almost unbroken, and in a condition fit for being at once put up in *bolts*, or bundles, whence this species of drum is called a *bolting-drum*. In another form, the drum is armed with rows of spikes projecting outward for about 2½ in., which revolve between similar rows of spikes on the interior of the cover; this kind threshes effectually, but breaks and chops the straw much more than the other forms of drum.

The attention of inventors and manufacturers of threshing-machines has not only been turned of late to the question of securing increased speed, but also of providing against the risk of accidents to those employed about the mills. The feeding of those high-speed drums which were getting so common was attended with considerable danger. Within the last few years, however, mills have been constructed, and are working well, with patent self-feeding apparatus. Considerable protection to life seems to have thus been afforded. The self-feeding apparatus consists of a covered hopper containing a shaking-board on which the sheaves are thrown sideways. Through this board, iron spikes curved like a fork or rake move forward and seize the unthreshed grain. A second row of spikes regulates to a nicety the quantity of stuff reaching the drum at a time; and while the shaking-board is falling to let the grain come in contact with the drum, the first row of spikes progresses to catch a fresh supply. Some of the English threshing-machines fitted up in this way within the last few years thresh from 8 to 10 quarters of grain per hour, and perform their work in every respect satisfactorily.

The driving-power is wind, water, horse-power, or steam; the first of which is so very uncertain and unequal in its operation that it has nowadays been mostly superseded by the others. Water-power (q.v.) is always desirable, and when it can be had in sufficient quantity or regularity, it is much to be preferred in point of economy, its mode of application to threshing being either by the ordinary machinery of the water-wheel or by *Barker's mill* (q.v.). Horse-power was the agent in most common use in the earlier days of threshing-mills, the horses being yoked to beams attached to a vertical revolving shaft which communicated motion by means of beveled gear to the threshing-machine. But it was found that this kind of work was very trying for the horses, and interfered considerably with the other work of the farm; and accordingly steam-power, as being more economical, has extensively superseded horse-labor, engines of 4 to 10 horse-power being generally employed. Portable threshing-mills and engines are very generally employed in America, and to some extent in England, being thought by many to be more economical, from their saving the labor of transporting the crop from the stack to the barn; and from their adaptability to the requirements of a farmer who may rent more than one holding in a district. On the other hand, however, some prefer the fixed machine on account of cheapness and diminished liability to derangement.

THRIFT *Armeria*, a genus of plants of the natural order *plumbagineæ*, having the flowers collected into a rounded head, a funnel-shaped dry and membranous calyx, five petals united at the base, five distinct styles, and five stamens attached to the base of the petals. By many botanists it has been regarded as a subdivision of the genus *statice*, from which it is distinguished chiefly by having the flowers in heads.—The common thrift (*A. maritima* or *vulgaris*) is a plant which grows in turf-like tufts, with linear leaves, scapes a few inches high, and beautiful rose-colored flowers, an ornament of the sea-coasts of Britain and of Europe generally, and also frequently found on high moun-

tains. It is often planted in gardens as an edging, for which is very suitable, being of a fresh green all the year, and exhibiting its fine flowers in profusion in July and August, but it requires to be renewed every two or three years, the smallest rootless sets growing, however, with great readiness in the moist weather of spring. The flowers are an active and useful diuretic. From two drams to an ounce of the flowers, freshly gathered and quickly dried, should be gently boiled, and the patient allowed to drink as much of the decoction as he pleases. Some aromatic, as anise or cinnamon, is added.

THRING, Rev. EDWARD, educator and headmaster of Uppingham School in Wales, Eng., b. Nov. 20, 1821, was at Eton, and King's College, Cambridge, Eng. Filling the curacy at Stubbings, Cockham Dean, Eng., and spending six months at Rome, Italy, he came to his life-work as Headmaster of Uppingham School, County of Rutland, Eng., Sept. 10, 1853. It was then simply a school-house and a school-room with twenty-five boarding pupils. He had a scheme for giving to each boy, clever or stupid, his own proper and individual training, and for having at hand all the needful machinery for this purpose. In 1887, the school consisted of a chapel, new school-room, old school-room, class-rooms, eleven boarding-houses, a swimming-bath, carpentry, forge and metal workshops, gardens, sanatorium, and a preparatory school, with a staff of thirty-three masters, and the matron of the sanatorium. He died in 1887.

THRIPS, a genus of small insects of the order *hemiptera*, suborder *homoptera*, allied to *aphis* (q.v.), and included in the family *aphidii* of some entomologists. The species are numerous and widely distributed. They are very active, and some of them very troublesome, by the injury which they do to cultivated plants, upon the juices of which they live. When disturbed, although they use their wings, their motion resembles leaping rather than flying. The wings are much fringed. See illus., BEETLES, ETC., vol. II., fig. 21.

THROAT, AFFECTIONS OF THE. Common inflammatory sore throat has been already described in the article QUINSY; and other important throat diseases, aphtæ or thrush, and diphtheria, have also been discussed in special articles. The *malignant sore throat* of the older nosologists is now recognized as a modification of scarlatina. Another important variety of sore throat occurs as one of the forms of secondary syphilis. *Bronchocele* or *goitre*, which, to a certain degree, is an affection of the throat, is specially described under the latter name.

The disease popularly known as *clergyman's sore throat*, or *dysphonia clericorum*, and which is recognized in medicine under the name of *follicular inflammation of the pharynx*, first shows itself by huskiness of the voice, with more or less coughing, hawking, and expectorating, from an uneasy sensation in the throat; there is, moreover, a constant inclination to swallow. On examining the back of the throat, its mucous membrane is seen covered with granulation, caused by an accumulation of secretion in the follicles, which sometimes burst and discharge their contents, which are of an elastic consistent nature. This discharge is occasionally followed by ulceration. The disease commonly arises from too prolonged or powerful exercise of the voice by persons in whom the mucous membrane of the throat is in a relaxed condition. Perfect rest from public speaking, preaching, acting, etc., is of more importance than anything else in the way of treatment, and a residence during the winter and spring in a mild and equable climate is expedient. Torquay, Ventnor, Nice, Mentone, Algiers, and Egypt, afford a choice of suitable residences. Tonics, such as iron, quinia, and strychnia (in small doses not exceeding $\frac{1}{10}$ of a grain, three times a day), should be tried; but the local application of a strong solution of nitrate of silver (from 20 to 80 grains in one ounce of distilled water), applied by a probang to the affected mucous membrane, is usually of far more service than internal remedies. The best work on this subject is that of Dr. Horace Green, an American physician.

Passing over several throat affections of minor importance, we proceed to the consideration of wounds in the throat. These wounds are comparatively seldom the result of accident; they are more often made with a murderous intent, and most frequently they are made with the view of committing suicide.

The first duty of the surgeon, in treating a case of cut throat, is to arrest the flow of blood. Ligatures should be applied to the wounded arteries, and steady pressure with the finger (beneath which a small pad of lint is placed) to the wounded veins, such as the external jugular. If the internal jugular is wounded, fatal hemorrhage will very rapidly ensue, unless the wound is immediately plugged with small pieces of sponge, or pressure with the finger is maintained as long as necessary. With a knowledge of these means of checking hemorrhage by pressure, an intelligent non-professional person may be the means of saving life. When the bleeding has completely ceased, but not till then, means may be taken for bringing together the edges of the wound. In most cases, sutures, or even adhesive plaster, are inexpedient and even dangerous, and it is best to keep the parts in simple apposition.

THROCKMORTON, a co. in n.w. Texas, drained by the Brazos river and its branches about 900 sq. m.; pop. '90, 902, chiefly of American birth. The surface is uneven. The soil is adapted to grazing. Co. seat, Throckmorton.

THROCKMORTON, Sir NICHOLAS, 1513-71, held household positions with the duke of Richmond and Henry VIII. He served at Boulogne and with Somerset in the Scottish wars, was knighted and returned to parliament from Northampton. He took the

side of Mary against lady Jane Grey, though himself a Protestant. In 1554 he was charged with complicity in Wyatt's rebellion and was acquitted, but detained in the Tower for a year. After his release he lived in France until the accession of Elizabeth, under whom he became chief butler of England and chamberlain of the exchequer. From 1559 to 1563 he was Cecil's ambassador to France. In the proposed marriage between Mary, queen of Scots, and the duke of Norfolk, he opposed the wishes of Elizabeth and lost her favor.

THROMBOSIS (derived from the Greek *thrombos*, a clot of blood) is a term originally suggested by Virchow, and was generally employed to designate an affection of the blood-vessel, (either veins or arteries) which essentially consists in a coagulation of blood (forming a true clot) at a certain fixed spot. Under certain morbid conditions, the blood has a tendency to coagulate in its vessels during life, on the least provocation. Thus, slight pressure on the side of the vein will sometimes induce this coagulation, while in other cases it is due to inflammation of the tissues which surround a vein, or laceration of a vein (as when the placenta is expelled from the uterus). A clot thus formed in a vessel increases and extends from one to another, till it reaches and finally fills a large vessel. Clots of this kind occurring in veins have been noticed from the times of Ambrose Paré and Petit, who seem to have been the first to apply the term *thrombus* to them.

TRONDHJEM, or TRONDHJEM (Ger. *Drontheim*), the ancient Nidaros, and former capital of Norway, is situated in the Fjord of Thronthjem at the mouth of the little river Nid, 240 m. n. of Christiania; pop. '93, 28,792. Thronthjem, which consists of the old town, founded in 997, and the suburbs of Blakland and Ilen, is built on the picturesque slopes of the Nid Elv, and has regular and broad streets. The fortified island of Munkholm and the fortress of Christiansteen defend the capacious harbor, which is never closed by frost on the seaward side. Among the public buildings the most noteworthy are the Kongens-Gaard, or old palace, and St. Olaf's church, the remains of the old cathedral, now partially restored, built in the 12th century, by archbishop Oeysteen, who erected this noble Gothic pile on the site of the two early Christian churches which had been founded by Harald Haardrade and Olaf II. The fine western extremity of the nave was not completed till 1248. The body of the murdered St. Olaf was preserved within a costly shrine in the chancel of Christ church, which ranked as the metropolitan church of Norway, where the kings of Norway have been crowned since the time of Magnus V. (1164). Trondhjem is the seat of government for the province and of a bishopric, and has a public exchange, the principal national bank, a public library, museum, various literary and scientific institutions, an institution for the deaf and dumb, an insane asylum, etc. The chief articles of trade are fish, tar, deal, and copper, which is obtained from the neighboring mines of Røros. Salted cod and herrings, which are found in large quantities at the entrance of Thronthjem Fjord, are important articles of export. Besides its shipping and coasting trade Thronthjem is the center of considerable manufacturing activity, and has good sugar-refineries, distilleries, etc. The environs of Thronthjem are picturesque, and its position is one of considerable attraction, notwithstanding the high northern latitude (63° 25'); while the numerous historical events with which it is associated render it one of the most interesting towns in the Scandinavian kingdoms. The preponderance of wooden houses has somewhat diminished of late years, and the local authorities are endeavoring to enforce the use of stone for building purposes, in consequence of the frequent occurrence of great fires.

THRONE (Gr. *thronos*), the chair of royalty, an ornamented seat raised above the level of the floor, on which it stands, often covered with a canopy, and intended for the use of a sovereign or other potentate. From an early period the Asiatic monarchs are represented as enthroned; the same usage of a dignified chair set apart for the sovereigns was adopted in Greece, where also it was customary to represent all the greater gods as enthroned. In the middle ages and modern times, the throne has been in all monarchical countries the chair occupied by the sovereign on state occasions. The name of throne was also given, in the early centuries of the Christian church, to the raised seat in the middle of the tribune behind the altar, where the bishop sat surrounded by his clergy. The throne is now a common metaphorical expression for sovereign power and dignity.

THROSTLE. See SPINNING.

THROW, the term applied in mining to the amount of dislocation (q.v.) in a vertical direction, produced by a fault in the strata.

THRUSH, *Turdus* or *Merula*, a genus of birds of the family *merulidæ* or *turdidæ*, having a bill of moderate size, straight, the upper mandible convex, its point compressed, notched, and slightly curved downward, the gape furnished with a few hairs; the nostrils near the base of the bill, oval, partly closed by a naked membrane; the first feather of the wing very short, the third and fourth longest; the tarsus longer than the middle toe, the outer toe connected with the middle toe at the base. The species are numerous and widely distributed, some of them inhabiting temperate and even cold countries, and some found only in tropical regions. Some of them are birds of passage, as the fieldfare and redwing. Some are gregarious, particularly in winter, as the species

just named; others live solitary or in pairs. The common British species are the blackbird (q.v.), fieldfare (q.v.), redwing (q.v.), ring ouzel (q.v.), song thrush, and missel thrush.—The SONG THRUSH, or THROSTLE (*T. musicus* or *M. musica*), the mavis of the Scotch, is smaller than the blackbird, its whole length being not quite nine inches. Its plumage is brown, of various finely-mingled shades; the throat, sides of the neck, breast, and flanks yellowish, spotted with dark brown; the belly nearly white, with a few spots of dark brown; a dark brown streak, with a lighter brown streak over it, passing from the bill to the eye. It is found in all parts of Europe, but deserts some of the northern parts in winter, being thus partially a bird of passage. It remains all the year in Britain. It feeds on insects, worms, slugs, snails, berries, and seeds. It often makes its nest in the center of a thick bush or shrub, and sometimes in an open shed. The eggs are usually four or five in number. The male takes part in the work of incubation, and is very attentive in feeding his mate while so occupied. The throistle is well known as one of the sweetest songsters of the groves. In captivity, it has been taught simple airs.—The MISSEL THRUSH (*T. viscivorus* or *M. viscivora*) is about 11 in. in entire length, and is the largest and strongest European species of the genus. The plumage is very similar to that of the song thrush. The tail is slightly forked, which is not the case in that species. The spots on the belly are more numerous and black. The song is loud and clear, but not equal to that of the song thrush or of the blackbird. The bird delights in pouring forth its song from the very top of a tall tree. It also very often sings before or during wind and rain, whence it has received the name of stormcock. Its nest is generally fixed in the fork of a tree. It is found in almost all parts of Britain where there are woods. Its range extends through great part of Asia; it is found in India.—The WOOD THRUSH (*T. mustelinus* or *M. mustelina*) is abundant in North America in summer, as far n. as Hudson's Bay, retiring to tropical and subtropical regions in winter. It is rather smaller than the song thrush and very similar to it. It is of a very shy and retiring disposition. It has a clear but very simple song, which is to be heard in the depths of the forest, far from the haunts of men. Several other species are found in North America. India has some. A common West India species (*T.* or *M. leucogenys*) is familiarly known by the name of hopping Dick, and is a general favorite from its bold lively manners, and its sweet song. All the species are in esteem for the table, and the song thrush is much sought for this use in Italy in the season of ripe grapes, when it becomes very fat. Gardeners in Britain well know how troublesome thrushes are where numerous, from their avidity for cherries and small fruit.

THRUSH, known also as *infantile sore mouth*, is essentially a disease of early infancy, although it may occur at any age. Its characteristic symptom is the presence of small roundish white specks or patches on the lining membrane of the cavity of the mouth and throat, on the surface of the tongue, the angles of the lips, etc. These patches, which are termed *aphthæ*, look like minute drops of tallow or fragments of curd, and are formed by elevated portions of epithelium covering a drop of serous fluid; and as the dead epithelium falls off, a raw surface, or a dirty ash-colored spot, is left exposed. In thrush, crops of these little patches commonly succeed one another. These spots render the mouth hot and tender, in consequence of which the act of sucking is accompanied by difficulty and pain. In association with these local symptoms are indications of general constitutional disturbance, such as feverishness, drowsiness, sickness, flatulence, colicky pains, diarrhoea, etc. The stools are green and slimy, and not unfrequently acrid, as may be inferred from redness of the anus being a common symptom. The vomited matters are also green, and have a strongly acid smell, as also has the breath. The complaint sometimes seems to be the result of improper diet, if the child is being brought up by hand, or of unwholesome milk from a diseased or intemperate nurse; of bad ventilation, etc.; but in some cases the cause of the disease is not evident. The disorder usually lasts eight or ten days, and is only attended with danger when the local affection runs into a low form of gangrenous ulceration. As undue acidity of the stomach seems to be an almost general symptom, the diet should be carefully regulated, and mild *antacids* prescribed. Dr. (Sir Thomas) Watson specially recommends a mixture of 2 parts of dried carbonate of soda and 1 of gray powder (mercury with chalk), of which from three to five grains may be given thrice daily. As a local application to the patches honey of borax may be applied with a camel-hair pencil; or a pinch of a mixture of powdered borax and loaf-sugar (1 to 8 or 10) may be placed occasionally on the tongue, and the infant allowed to spread it over the mouth.

THRUSH, or TRUSH, in the horse, consists in inflammation and ulceration of the sensitive surfaces within the frog, giving rise to a fetid discharge, constituting unsoundness, and usually causing lameness. Want of cleanliness is the chief cause. Daily, when the horse returns to his stable, the foot should be washed out with soap and water, carefully dried, and the fissures filled with mineral tar. If amendment does not speedily ensue, a dressing of calomel should be substituted for the tar several times a week. Ragged or loose portions of the frog may be removed by the knife or scissors.

THUCYDIDES, the great historian of the Peloponnesian war, born of the demus Halimus, most probably in 471 B.C., is said to have been the son of Olorus and Hegesipyle, and connected with the family of Cimon. It is stated—on authority equally conjectural, however—that he was instructed in oratory by Antiphon, and in philosophy by

Anaxagoras. Certain it is that, Athenian as he was, of good family, and resident in the most cultivated community in Greece, he must have enjoyed a most liberal education. He was further possessed, either by inheritance or by acquisition through marriage, of gold mines in that part of Thrace lying opposite the island of Thasos. He left a son called Timotheus, and perhaps also a daughter, who is said by some scholars to have written the eighth book of his history. We know from himself that he was one of the sufferers from the terrible plague of Athens, and also one of the few who recovered. We have no direct evidence as to his having displayed in public the oratorical talent which he reveals in his history; but it is certain that he held military command, and that he had under him an Athenian squadron of seven ships at Thasos, 424 B.C., when Eucles, who commanded in Amphipolis, solicited his assistance against Brasidas. The expected arrival of a superior force induced Brasidas to offer Amphipolis favorable terms, which were accepted. Thucydides arrived on the evening of the same day on which Amphipolis had surrendered; and though he prevented Eion, at the mouth of the Strymon, from falling into the enemy's hands, still his failure to save Amphipolis caused him to be sent into exile, probably to avoid the severer punishment which his enemy Cleon, then so popular with the Athenians, was designing for him. Where his exile was spent, is not known. Probably he lived a good deal in the Peloponnesus, if not also in Sicily, as has been inferred from his minute descriptions of Syracuse and its neighborhood. According to his own account, he lived in exile twenty years, and probably returned to Athens about the time when Thrasybulus liberated it, in the beginning of 403. Ancient authorities are all agreed that his end was a violent one, though whether it occurred at Athens or in Thrace, we have no means of ascertaining. The year of his death is generally fixed at 401. Uncertainty also prevails as to the time when he wrote his history. He is supposed, from hints supplied by himself, to have kept a register of the events of the war, from its outbreak to its close. His great work, chronologically divided into winters and summers—each summer and winter making a year—was subsequently rearranged, probably by Alexandrine critics, into the books and chapters as we now have it; and of these books the eighth (and last) is supposed either to have not been written by him, or to have not received the same careful revision which he bestowed on the previous seven. There is hardly a literary production of which posterity has entertained a more uniformly favorable estimate than the history of Thucydides. This high distinction he owes to his undeviating fidelity and impartiality as a narrator; to the masterly brevity of his style, in which he is content to give in a few simple yet vivid expressions the facts which it must have often taken him weeks or even months to collect, sift, and decide upon; to the sagacity of his political and moral observations, in which he shows the keenest insight into the springs of human action, and the mental nature of man; and to the unrivaled descriptive power exemplified in his account of the plague of Athens, and of the Athenian expedition to Sicily. Often, indeed, does the modern student of Greek history share the wish of Grote, that the great writer had been a little more communicative on collateral topics, and that some of his sentences had been expanded into paragraphs, and some of his paragraphs into chapters. But this want cannot have been felt by the contemporaries of Thucydides; while the fate of other ancient historians warns us that had his work, like theirs, been looser in texture, or less severely perfect, it would not have survived, as it has done, the wearing influence of time, or remained, in its own language, the *ktēma es aiei*—the “possession forever”—it has proved to the world. The best editions are those of Poppo (11 vols. Lps. 1821-40), of Krüger (2 vols. Berl. 1846-47), and—at least for historical illustration—of Arnold (3 vols. Oxford, 1830-35). The best English translation is by Richard Crawley (1874); that of the Rev. Thomas Dale is also good.

THUG (from the Hindustani *thaga*, deceive; hence, literally, a deceiver, a cheat) is the name of a religious fraternity in India, which, professedly in honor of the goddess Kālī, the wife of Ś'iva, is addicted to the commital of murders, and chiefly lives upon the plunder obtained from its victims. The name of Thugs is that by which this fraternity is generally known among Europeans in the more northern parts of India. In some provinces to the southward they are called *Phansigars*, or “stranglers” (from the Hindustani *phansi*, a “noose”). In the Tamil language their name is *Ari Tulukar*, or “noosers;” in the Canarese, *Tanti Kalleru*, or “thieves who use a cat-gut noose;” and in Telugu, *Varla Vandla*, or “people who use the noose.” In the s. of India they used to live under the protection of the native chieftains, who, on the consideration of a settled contribution, and probably also of a share in the result of their depredations, connived at their practices, which, to the uninitiated, were generally concealed under the guise of an honest industry, especially that of the culture of land.

The proceedings of the Thugs are generally these: Banding together in gangs of from 10 to 50, but sometimes also of a much greater number, they assume the appearance of ordinary traders, traveling, if enabled to do so by their wealth, on horseback, with tents, and all the comforts of opulent merchants; but if this be not possible, also in more humble characters. Each gang has its *jemadar*, or leader; its *guru*, or teacher; its *sothas*, or entrappers; its *bhuttotes*, or stranglers; and its *bughaees*, or grave-diggers. On arriving at towns and villages, they pretend to meet by accident, and to have no previous acquaintance with one another. Some of the gang are then employed as emis-

saries to collect information; and when learning that any persons of property are about to undertake a journey, they endeavor to insinuate themselves into their confidence, and usually propose to them, under the plea of safety, or for the sake of society, to travel in their company; or else they follow them, waiting for the proper opportunity of carrying out their murderous work. The latter is generally perpetrated by throwing round the neck of the victim a rope or cloth, which one of the gang holds at one end, while the other end is seized by an accomplice; and while the two Thugs draw the noose tight, and press the head of their victim forward, a third seizes him by the leg, thus causing him to fall to the ground. The fatal injury is then easily inflicted. Travelers staying in the same choultry, or public resting-place, are sometimes murdered in the night. In attacking a traveler on horseback, generally one of the gang goes in front of the horse, while another keeps himself in the rear; a third, walking by his side, when finding him off his guard, suddenly seizes him by the arm, and drags him to the ground: the sufferer is then strangled in the usual manner. Three Thugs are therefore generally required to murder one man; two, at the least, are thought necessary; for to strangle a man single-handed is a rare occurrence, and a feat of this kind is esteemed by the fraternity a most honorable distinction, which goes far to ennoble, in the eyes of his fellows, the Thug who has accomplished it, and even his family, for many generations. After the murder is perpetrated the body of the victim is generally mutilated, in order, it seems, to expedite its decomposition, and thus to guard against discovery. For the same reason, care is taken to inter the body at a spot where it is not likely to be found; and thus it could happen that entire parties of travelers were destroyed, and not a vestige of them was discoverable. The indiscriminate slaughter in which the Thugs seem to indulge, is to a certain extent restrained by superstition; thus, it is deemed unlucky to kill certain classes and castes; and, as a rule, the female sex is exempt altogether.

The mode of dividing the plunder is probably various. According to one account, "a portion of it is usually appropriated to defraying the expenses of religious ceremonies; and sometimes a part was also allotted for the benefit of widows and families of deceased members of the gang. The residue of the booty being divided into several parts, was generally shared as follows: To the leader, two shares; to the men actually concerned in perpetrating the murder, and to the person who cut the dead body, each one share and a half; and to the remainder of the gang, each one share."

The practice of Thugs is not restricted to adventures on land. The rivers of India also are infested by bands of these robbers, who have similar habits to those of the land Thugs. They generally go in considerable parties—the one assuming the dress of travelers of respectability, the others acting as boatmen. When going up the river, they always pretend to be men going on pilgrimage to Benares, Allahabad, or some other sacred place; when going down, they pretend to be on their way home from such places. The travelers intended for their victims are inveigled on the high-roads, and murdered inside the boat, while some of the gang above sing and play. At a signal given by these that all is clear, the bodies of the murdered men are thrown into the river.

The patron goddess of the Thugs is *Devī* or *Kālī*, the wife of the god *S'iva*, and the deity of destruction. In her name they exercise their profession, and to her they ascribe its origin. Formerly, they believe, *Kālī* co-operated with the Thugs, and assisted them in the disposing of the bodies of their victims by devouring them. But through an indiscretion of one of the fraternity, who, out of curiosity, pried into the proceedings of the goddess, she became displeased, and condemned them in future to bury their victims. But though she now refused her future assistance, she presented her worshippers with one of her teeth for a pickaxe, a rib for a knife, and the hem of her lower garment for a noose. Whether on the faith of this legend or otherwise, it is certain that the pickaxe is the instrument which, by all the Thugs, is held in the highest estimation. Its fabrication is superintended with the greatest care, and it is consecrated to its duties under many and minutely regulated ceremonies; and after it has thus been prepared, it is only intrusted to a Thug selected for this dignity on account of his shrewdness, caution, and sobriety. The place where, and the manner in which, it is then deposited are likewise the subject of the strictest rules; and it is submitted to special purifications after each time that it has been used for the preparation of a grave. The pickaxe is, in short, looked upon with the highest reverence by a Thug; it is the symbol of his faith, and the chief object of his superstitions. That these superstitions are gross and numerous may be easily anticipated. The belief in omens, especially, plays a great part in a Thug's career. All his movements are regulated by it, and the learning of the Thugs consists in a thorough acquaintance with them.

To a neglect of the warnings given by omens, or to an imperfect acquaintance with them, the Thugs invariably ascribe a failure of their undertakings, if it happens. When preparing for an expedition the auspices are always solemnly taken; and only if favorable it is carried out. Among the bad omens they count the meeting the corpse of any one belonging to the village, the meeting an oil-vendor, a carpenter, a potter, a dancing-master, a lame or blind man, a fakcer with a brown waistband, or a Hindu devotee with long traced hair. To sneeze is a bad thing at setting out on an expedition; to meet a woman with an empty pitcher, or an ass braying from the front, a pair of jackals crossing the road in front of the gang, to see a wolf cross the path from left to right. On the other hand, it is a lucky omen to meet a woman with a pitcher full of water, or a preg-

nant woman, or to hear an ass braying on the left while halting at a stage, or to see a single jackal passing from right to left, or an antelope from left to right. Superstitions like these—and it is not necessary to give more instances of them—sufficiently show that the Thugs consider their murderous practices as countenanced and regulated by higher powers; and it is for the same reason that after every murder they perform a special solemnity called *tapunî*. It is celebrated in honor of the terrific Kâli, and its principal feature consists in addressing a prayer to the goddess, and in making the practical stranglers, those who formed part of the expedition, and committed the murders, partake of *gaur*, or consecrated sugar, the effect of which is believed to be irresistible. Other ceremonies are, of course, likewise performed on the occasion; but it is from the eating of the gaur that the strength and prosperity of the Thug are supposed necessarily to be derived. Another feast observed by the Thugs throughout India is called *Kurhæ Kârna* or *Kote*. It likewise takes place in honor of Kâli, and the requisites for its celebration are goats, rice, ghee (butter), spices, and spirits. The superstitions of the Thugs are all of Hindu origin; but they are adopted also by the Mohammedans, who, while stout adherents to the tenets of the Koran, yet pay divine honors to the Hindu goddess of destruction. This inconsistency they sometimes reconcile by identifying Kâli, whose other name is also Bhavânî, with Fatima, the daughter of Mohammed, and wife of Ali, and by saying that Fatima invented the use of the noose to strangle the great demon Rukutbeejdana.

At various periods steps were taken by the native and English governments to suppress Thuggee—the practice of the Thugs—but it is only since 1831 that energetic measures were adopted by the British authorities to counteract the evil; and though it has not yet altogether disappeared, it may be safely assumed that it is fast dying out.—For a fuller account of the Thugs the reader is referred to the *Illustrations of the History and Practices of the Thugs* (by E. Thornton, Lond., 1837)—whence the foregoing outline is taken; to the authentic reports of special cases contained in the same work; and to Col. Meadows Taylor's *Confessions of a Thug* (1840).

THUJA. See ARBOR VITÆ.

THULE, the name generally given by the ancients to the most northerly part of Europe known to them, and in the description of which fancy played a conspicuous part. According to Pliny, it was an island in the northern ocean, discovered by the navigator Pytheas, who reached it after six days' sail from the Orcades. The name Thule appears to be merely a classic form of the Gothic *Tiel* or *Tiule* "remotest land" (comp. Gr. *telos*, a goal); and most modern geographers identify Thule with Iceland. Some, however, prefer to seek for it in that part of Norway called *Thile* or *Thilemark*, or in Jutland, the extremity of which is known as *Thy* or *Thyland*. Ptolemy considers that Mainland, the principal member of the Shetland group, has the best claim to being regarded as the Thule of Pytheas.

THUMB IKINS, or THUMBSCREW, an instrument of torture for compressing the thumb, largely made use of by the Inquisition in Spain, and also occasionally used in England when examination by torture was practiced there. The last instance of its application in Britain was in the case of principal Carstairs, on whom this mode of torture was inflicted for an hour and half at Holyrood by the Scottish privy council, with the view of obtaining from him confession of the secrets of the Argyll and Monmouth parties, but without effect in producing any disclosures.

THUN, a picturesque and ancient t. of Switzerland, in the canton of Bern, 17 m. s.s.e. of the city of that name. It stands on the Aar, 1 m. from the lake of Thun, out of which the river rushes past the town in a stream of crystal clearness. The old castle of the 12th c. with its corner towers, and the venerable church, are the chief buildings. Thun is the starting-place for those who visit the Bernese Oberland, and is consequently visited by crowds every season. Pop. '88, 5505.

THUN, LAKE OF, in the canton of Bern, Switzerland, between the t. of Interlaken on the e., and that of Thun on the n.w.; is 11 m. long, 2 m. broad, about 1800 ft. above sea-level. Its greatest depth is 1130 ft. The scenery is very attractive. Steamers ply on the lake, and the railway from Thun to Interlaken skirts the s. shore.

THUNBERG, CARL PETER, 1743–1828; b. Sweden; studied with Linnæus at Upsal; sailed with a Dutch ship as surgeon, 1771–73, cruising at the cape of Good Hope; lived 6 years in Java and Japan, returning in 1779 to Sweden, where he was appointed successor to Linnæus in 1781 as professor of botany at the university of Upsal.

THUNDER. See LIGHTNING.

THUNDERBOLT, in heraldry, a bearing borrowed from classical mythology, which may be described as a twisted bar in pale inflamed at each end, surmounting two jagged darts in saltire between two wings displayed with streams of fire.

THURGAU (i. e., valley of the Thur), a frontier canton in the n.e. of Switzerland, bounded on the n.e. by the lake of Constance, and on the w. and s. by the cantons of Zurich and St. Gall. Area, 384 sq. m.; pop. '88, 105,121. The surface, unlike that of the other cantons of the country, is undulating or hilly, but nowhere mountainous, the chief height being the Hörnli in the extreme s., 3690 feet. The principal river is the

Thur, from which the canton derives its name, and from which, flowing w.n.w. through a broad valley, joins the Rhine in the canton of Zürich. The soil is fertile in the ordinary crops, and remarkably so in fruits—large tracts of open country being laid out in orchards, as well as vineyards. Three-fourths of the inhabitants are Protestants. Capital, Frauenfeld.

THURIFER (Lat. *thur*, incense, and *fer.*, to carry), the ministering attendant in the Roman Catholic church, at solemn mass, vespers, and other solemn ceremonies, whose duty it is to carry the *thurible*, or incense vessel, and either to minister incense (q.v.) himself, or to present the thurible to be used for that purpose by the officiating priest. The office of thurifer is one of those which belong to the so-called "Minor Order" of *acolyte*. See ORDERS, HOLY. The thurible now in use, consists of a metallic vessel for holding burning charcoal, commonly of silver or silver-plated, but occasionally also of gold, with a movable cap, and suspended from four chains, so as to be capable of being freely waved about in the air for the readier dispersion of the smoke of the incense, which is thrown upon the live charcoal. See illus., CEREMONIES, vol. III.

THÜ RINGER-WALD (Forest of Thuringia) is a considerable mountain-range of central Germany, which extends from the junction of the rivers Werra and Horsa, near Eisenach (q.v.), in a s.e. direction to the n. of Bavaria, where it joins the Frankenwald, a ramification of the Fichtel-Gebirge. Its total length is about 60 m., and its highest summits (Gross-Beerberg, Schneekopf, Inselsberg, and Finsterberg) range from a height of close on 3000 ft. to about 3200 feet. The range is composed mostly of granite, porphyry, and argillaceous schists, abounding in metallic veins, among which iron ore is most conspicuous, though copper, nickel, and cobalt are also found, and auriferous sands occur in some of the rivers which have their source here. The Thüringer-wald is parceled out among the states of Weimar, Meiningen, Coburg-Gotha, Prussia, Schwarzburg, Reuss, and Bavaria.

THURINGIA (Ger. *Thüringen*), the name still borne by that part of upper Saxony which is generally bounded by the Werra, the Saale, and the Harz mountains, though it has no longer any distinct terminal significance. The country was so-called from the people Thuringii (probably the descendants of the Hermunduri), who were found inhabiting it in the 5th century.

THURLES, a market-t. and seat of a poor-law union in the county of Tipperary, province of Munster, Ireland. It is a place of great antiquity, and is celebrated not only in the bardic history, but also as the scene of a great battle with the Danes. It is situated on the river Suir, 52° 42' n. lat., 7° 47' w. long., 86 m. s.w. from Dublin, with which city, as well as with Cork, it is connected with the Great Southern and Western railway. Pop. of township '81, 4,850, with few exceptions Roman Catholics. Thurles being the seat of the Roman Catholic archbishop has two convents of nuns, a monastery of Christian brothers, and a college for ecclesiastical and general education, numerously attended.

THURLOW, EDWARD, Baron, an English lawyer, was born in 1732, at Little Bracon-Ash, in Norfolk. His father, a clergyman, sent him to school at Canterbury, where he obtained a sound knowledge of the Latin and Greek classics. Thence he proceeded to Cambridge, but in his zeal, it is said, to affect the character of an idle clever boy, he committed breaches of discipline which compelled him to leave the university. He became a student of the Inner Temple, and was called to the bar in 1754. He was a fellow-pupil, in a solicitor's office, with the poet Cowper, and still affected idleness, although, in reality, he worked hard to make himself a good lawyer. His lofty stature, strongly marked features, dark eyes, bushy eyebrows, and look of self-possession and wisdom, led, it appears, every one with whom he came in contact to attribute to him qualifications he really did not possess. His gifts, however, were those most likely to insure early success at the bar. An accidental meeting, at a coffee-house, with the Scotch solicitors in the great Douglas case, led to his employment in it as junior counsel, and to his acquaintance with the members of the Douglas family. It was one of them, the duchess of Queensberry, who, by her influence with lord Bute, obtained for him, in 1761, the rank of king's counsel. After this period, he acquired a still higher reputation by his speech in the Douglas case—the greatest effort of his life. In 1768, he was returned from Tamworth, and became a zealous supporter of lord North. When, in 1771, he was appointed solicitor-general, he attracted the especial notice of George III. by the zeal he displayed in supporting the American policy of the government. In 1778, he was made lord chancellor; and such was his influence with the king, that he was allowed, contrary to all precedent, to retain the office under the Rockingham administration. He caused great embarrassment by opposing all the measures brought in by that government. Under the coalition ministry, he was compelled to retire; but he was restored as chancellor on Mr. Pitt coming to power. For a time he supported the government; but relying again on the support of the king, he once more began to give trouble, and ventured to oppose the measures his colleagues brought forward. Pitt then intimated that he or Thurlow must retire, and the king, without any hesitation, consented to his removal (1792). Thurlow

sank into comparative obscurity. He amused himself in reading the Latin and Greek classics with his nephews, and spent much of his time in visiting and receiving visits. He died at Brighton on Sept. 12, 1806. Lord Campbell finds nothing recorded of him to justify the great reputation for ability he had among his contemporaries, but it must be recollected that it was his conversation which was admired.

THURMAN, ALLEN G., p. Va., 1813; removed to Ohio while still a child, and received there an ordinary school education, but was well grounded in the French language by a Paris professor who lived in his family. He fitted himself for the bar, and was admitted in 1835 to practice; represented Ohio in the 29th congress; was judge of the supreme court of that state in 1851, and in 1854 chief justice. In 1869 he was elected to the U. S. senate to fill the unexpired term of Benj. F. Wade; and was re-elected in 1874. He retired from the senate March 3, 1881, after 12 years' continuous service, with a high reputation for statesmanship and integrity. His views on finance were toward the expansion of the circulating medium, but in general politics he was profoundly democratic. He was a prominent candidate for the democratic nomination for president, and in 1888 was an unsuccessful candidate for vice-president. He died Dec. 12, 1895.

THURSBY, EMMA, b. Brooklyn, N. Y., 1857. She studied under Julius Myer and Errani, and sang in the Plymouth Church choir, Brooklyn, 1870. She went to Italy to study, 1873, and returned to complete her musical education under Errani and Mme. Ruderstorf. She made a successful tour of the U. S. and Canada, 1875; was warmly received in England and France, 1878-9, and was engaged by Maurice Strakosch as prima donna of his company, 1880. She has had great success in Europe, and holds high rank as a concert-singer. Her voice is a clear and flexible soprano.

THURSDAY (Swed. *Thorsdag*, Ger. *Donnerstag*), the fifth day of the week, is so called from Donar or Thor (q.v.), who, as god of the air, had much in common with the Roman Jupiter, to whom the same day was dedicated (Lat. *Jovis dies*, Fr. *Jeudi*).

THURSO, a seaport and market town on the n. coast of Caithness, Scotland, 18 m. n.n.w. of Wick. It exports flag-stones. Pop. '91, 3930.

THURSTON, a co. in n.e. Nebraska; 398 sq. m.; pop. '90, 3176. Co. seat, Pender.

THURSTON, a co. situated in s.w. Washington; bounded n.e. by the Nisqually river; drained by the Des Chutes river; crossed by the Northern Pacific and other railroads; about 768 sq. m.; pop. '90, 9675. Co. seat, Olympia.

THURSTON, ROBERT HENRY, b. R. I., 1839; educated at Brown university. In 1861 he was appointed to the engineers in the navy. He served through the civil war, and in 1866 became assistant prof. of natural philosophy and lecturer on physics and chemistry at the U. S. naval academy. After making a study in England of the iron manufactures, he was called in 1871 to the chair of mechanical engineering at the Stevens institute of technology, Hoboken, N. J. In 1873 he went to Vienna as a member of the U. S. scientific commission. He was on the international jury of the exhibition, and published a report on *Machinery and Manufactures*. In 1875 he served on the U. S. commission on the causes of boiler explosions. Among his inventions are the magnesium-ribbon lamp, and an improved steam-engine governor. In 1885 he was made director of the Sibley college of mechanical engineering of Cornell university. He was a member of the U. S. commission on the construction of safes and bank vaults in 1891. He has published *History of the Steam Engine* (1878); *Materials of Engineering* (1882-6); *Manual of the Steam Engine* (1890); *Manual of Steam Boilers* (1890); *Engine and Boiler Trials* (1890); and has translated Carnot's *Réflexions sur la Puissance motrice du Feu*.

THWARTS, in a boat, are the cross-benches on which the rowers sit.

THYATIRA. See AK-HISSAR.

THYLACINE, *Thylacinus*, a genus of carnivorous marsupial quadrupeds, nearly allied to opossums and dasyures. The muzzle is elongated, and somewhat dog-like. The tail is long and tapering. Only one species is known (*T. cynocephalus* or *Harrisi*), a native of the mountainous parts of Van Diemen's Land, where it inhabits the wildest glens, but issues from them to prey on the sheep of the colonists, by whom it is commonly called the wolf, or tiger-wolf, and is destroyed by all possible means. See illus., MARSUPIALIA, vol IX.

THYME, *Thymus*, a genus of humble half-shrubby plants, of the natural order *labiate*, having a two-lipped calyx, and four diverging stamens. GARDEN T. (*T. vulgaris*) is 6-10 in. high, with narrow, almost linear leaves, and whitish or reddish flowers, which grow in separate whorls, six in a whorl. It is common upon dry hills in the s. of Europe, and is very commonly cultivated in gardens, on account of its fragrance.—WILD T. (*T. serpyllum*) has a procumbent stem with many branches, 2-3 ft. long, oval leaves and purplish flowers, arranged in whorls, which are united in a head. It is abundant on hills and mountains in Britain, and in all parts of Europe; and the n. of Asia. It is less fragrant than garden thyme, but both species contain an aromatic essential oil. The flowering branches (*herba thymi* and *herba serpylli*) are used in medicine as a powerful stimulant, and those of garden thyme are also used in cookery for flavoring. The LEMON T., or lemon-scented thyme of our gardens, is regarded as a variety of *T. ser-*

pyllum. It is generally of still lower growth than the common garden thyme.—No species of thyme is indigenous in America.

THYMELEA CÆÆ, a natural order of exogenous plants, of which the mezereon and spurge laurel (see **DAPHNE**) are familiar examples. This order consists chiefly of shrubs, like the spleen, suprarenal capsules, and thyroid gland, are placed among the ductless glands. It is a temporary organ, and is commonly stated to attain its greatest development in relation to the rest of the body during the latter part of fetal life. "But this," says Dr. Carpenter, "is a mistake, for the greatest activity in the growth of this organ manifests itself in the human infant soon after birth; and it is then, too, that its functional energy seems the highest. This rapid state of growth, however, soon subsides into one of less activity, which merely serves to keep up its proportion to the rest of the body; but its increase is continued till the age of puberty is attained."—*Principles of Human Physiology*, 6th ed. p. 143. After remaining stationary for some years, it gradually assumes, in well-nourished persons, the characters of a mass of fat. On examining the gland when its growth is most active, it is found to consist of two lateral lobes placed in contact along the middle line, extending from the lower border of the thyroid gland to the cartilage of the fourth rib, and covered by the sternum and by the margins of the muscles passing upward from the top of that bone. The gland is of a pinkish gray color, soft and lobulated on its surfaces; and by careful manipulation it may be shown to consist of an assemblage of hollow glandular lobules, united together by connective tissue, all their cavities communicating with a central reservoir or main canal, from which there is no outlet. This arrangement is well seen in the gland of a calf. The thymus is about 2 in. in length, one and a half in breadth, and 4 lines thick, and at birth it weighs about half an ounce; its chemical constituents are water, albumen, gelatine, sugar(?), fats, leucine, sarkine, xanthine, and formic, acetic, succinic, and lactic acids, besides the ordinary inorganic salts—the number of the ingredients, many of them of rare occurrence elsewhere in the body, indicating that important chemical changes take place in their structure. Its exact uses are unknown, but, like the other ductless or vascular glands, it doubtless plays some important part in the preparation and maintenance of the blood. The albuminous nature of the juice of this gland, and the finely granular appearance it presents, indicate that a material is here being prepared which is to be rendered subservient to nutrition; and various facts which have been noticed in regard to its changes of bulk, (especially its rapid diminution in over-driven lambs, and its subsequent gradual redistention during rest, if plenty of food is given) strongly confirm these views.

THYMIC ASTHMA. See **THYMUS GLAND**.

THYMUS GLAND, or simply the thymus (Gr. *thymos*, sweet thyme, because the gland was compared to the flower of this plant by Galen), one of those structures which, like the spleen, suprarenal capsules, and thyroid gland, are placed among the ductless glands. It is a temporary organ, and is commonly stated to attain its greatest development in relation to the rest of the body during the latter part of fetal life. "But this," says Dr. Carpenter, "is a mistake, for the greatest activity in the growth of this organ manifests itself in the human infant soon after birth; and it is then, too, that its functional energy seems the highest. This rapid state of growth, however, soon subsides into one of less activity, which merely serves to keep up its proportion to the rest of the body; but its increase is continued till the age of puberty is attained."—*Principles of Human Physiology*, 6th ed. p. 143. After remaining stationary for some years, it gradually assumes, in well-nourished persons, the characters of a mass of fat. On examining the gland when its growth is most active, it is found to consist of two lateral lobes placed in contact along the middle line, extending from the lower border of the thyroid gland to the cartilage of the fourth rib, and covered by the sternum and by the margins of the muscles passing upward from the top of that bone. The gland is of a pinkish gray color, soft and lobulated on its surfaces; and by careful manipulation it may be shown to consist of an assemblage of hollow glandular lobules, united together by connective tissue, all their cavities communicating with a central reservoir or main canal, from which there is no outlet. This arrangement is well seen in the gland of a calf. The thymus is about 2 in. in length, one and a half in breadth, and 4 lines thick, and at birth it weighs about half an ounce; its chemical constituents are water, albumen, gelatine, sugar(?), fats, leucine, sarkine, xanthine, and formic, acetic, succinic, and lactic acids, besides the ordinary inorganic salts—the number of the ingredients, many of them of rare occurrence elsewhere in the body, indicating that important chemical changes take place in their structure. Its exact uses are unknown, but, like the other ductless or vascular glands, it doubtless plays some important part in the preparation and maintenance of the blood. The albuminous nature of the juice of this gland, and the finely granular appearance it presents, indicate that a material is here being prepared which is to be rendered subservient to nutrition; and various facts which have been noticed in regard to its changes of bulk, (especially its rapid diminution in over-driven lambs, and its subsequent gradual redistention during rest, if plenty of food is given) strongly confirm these views.

The anatomy, physiology, and development of this gland have occupied the attention of three of the most celebrated writers of the present century: see sir Astley Cooper's beautiful monograph, *On the Anatomy of the Thymus Gland*, (1832); Mr. Simon's *Physiological Essay on the Thymus Gland*, (1843); and Prof. Goodsir's memoir "On the Development of the Thymus Gland," in the *Philosophical Transactions* for 1844.

The only disease of this structure requiring notice is hypertrophy—a condition which was supposed occasionally to induce suddenly fatal dyspnoea (breathlessness) in children. There are, however, sound reasons for believing that there is no essential connection between the glandular enlargement and the suffocative paroxysms; because (1) the affection termed *thymic asthma* may occur with an abnormally small thymus; and (2) when a thymus, enlarged by malignant disease (encephaloid, for example) does occasion dyspnoea, it is not sudden and paroxysmal, but constant in its nature. The disease is known under various other names, as *laryngismus stridulus*, *spasmodic croup*, and *child-croaking*. This *bastard croup*, as Dr. Watson calls it, is far more common than true croup, and is very liable to be confounded with it. "In their most obvious symptoms, the two affections are much alike. The broad and essential difference between them is the absence in the spurious disorder of inflammation and of fever, and consequently of any concrete or other effusion from the mucous membrane of the air-passages. The child is seized all of a sudden, roused perhaps from its sleep, or checked in the act of sucking, by a catch, or interruption of its breathing, more or less complete. It strives and struggles to inspire, but is apparently unable to do so; at length the effort is successful, and the breath is drawn in with a shrill whistling or crowing sound, like that which characterizes the inspirations of croup, or of whooping-cough, and depending, no doubt, upon the same cause—a nar-

rowing (in this complaint, temporary) of the fissure of the glottis."—*Lectures on the Principles and Practice of Physic*, 4th ed. vol. i. p. 866. The more complete the closure of the chink of the glottis is, the more intense will be the symptoms. In severe cases the countenance becomes livid, the eyes fixed, and there is an entire suspension of the respiratory functions for a while. The child makes vehement struggles to recover its breath, and at varied intervals, from a few seconds up to a minute or longer, air is admitted through the glottis, now partially open, and this rush of air produces the characteristic sound. A fit of coughing or crying then often supervenes, and the attack terminates with some exhaustion. If, however, the glottis does not partially open, the child will die suffocated (or in popular language, *in a fit*) at the end of two, or at most three minutes, falling back pallid and exhausted in its nurse's arms. In association with these symptoms is often a contracted state of the flexor muscles of the thumb, fingers, toes, wrist, and ankle, giving to the foot an appearance like that of a club-foot. It has been observed by Dr. Ley, who has written a volume on this disorder, and other observers, that there is a frequent connection between child-growing and certain other affections, as (1) tumefaction of the glands in the neck and chest, and entanglement of the pneumogastric nerve or its branches among these glands; (2) painful dentition, which is apt to produce glandular swellings of the neck; and (3) excoriations behind the ears, and inflamed and irritable scalp, which also occasion enlargement of the glands. The nerves passing from the enlarged gland to the nervous center convey the sensation of irritation; and the inferior laryngeal nerve, which supplies nearly all the muscles of the larynx, acts on the efferent or motor nerve, and excites spasmodic contraction of the muscles closing the aperture of the glottis. Hence the phenomena are those of reflex action.

During the paroxysm, the warm bath may be tried if it can be got ready at once. The application of hot fomentations to the throat by means of a large sponge, is often very serviceable, and is usually more accessible than the bath. The muscles sometimes relax when cold water is freely sprinkled over the chest and face, and these simultaneous applications of hot and cold water are by no means incompatible. The subsequent general treatment must depend upon the exciting cause, on the painful dentition, the eruption of the head, etc. The state of the bowels and of the skin must always be carefully regulated, and change of air is always advisable. Phosphate of lime, in doses of from 5 to 10 gr. 3 times a day, administered in chalk mixture, has been strongly recommended by Dr. W. Budd in this disease, and is well deserving of a trial.

THYROID BODY or GLAND (Gr. *thyreos*, a shield, and *eidos*, like), one of the ductless or vascular glands, lying at the upper part of the trachea, and consisting of two lateral lobes, placed one on each side of this canal, and connected together by a narrow transverse portion at the lower third, called the isthmus. It is of a brownish red color, and its normal weight is about an ounce, but it occasionally becomes enormously enlarged, constituting the disease called bronchocele or goiter. Each lobe is somewhat conical, and is about two inches long and three-quarters of an inch broad. The thyroid body differs from the other vascular glands in structure, for it "consists of an aggregation of closed vesicles, which seem to be furnished with a true liminary membrane, and therefore to be real gland vesicles embedded in a stroma of connective tissue, and not communicating with any common reservoir. These bodies vary in diameter in the human subject from $\frac{1}{100}$ to $\frac{1}{8}$ of an inch; and they contain an albuminoid plasma, which is either faintly granular or of a somewhat oily aspect, amid which are seen a number of corpuscles, the greater part of them in the condition of nuclei, while some have advanced to that of cells."—Carpenter's *Principles of Human Physiology*, 6th ed., p. 143. The thyroid body is abundantly supplied with blood by the superior and inferior thyroid arteries, which continue subdividing till they ultimately form a very minute capillary plexus upon the liminary membrane of the vesicles. This body, like the thymus and suprarenal capsules, is relatively larger in the fetus and during infancy than in after-life.

From the investigations of Mr. Simon (see his memoir on the "Comparative Anatomy of the Thyroid," in the *Philosophical Transactions* for 1884), it appears that a thyroid is present in all mammals, birds, reptiles, and amphibians, and that he has discovered it in many fishes. Its presence in some of the fishes in which Mr. Simon observed it, has, however, been called in question by Dr. Handfield Jones, (see his article "Thyroid Gland" in the *Cyclopædia of Anatomy and Physiology*).

Mr. Simon has propounded a theory regarding the function of this gland which is certainly ingenious, and probably correct. Basing his theory on the circumstance, that the thyroid arteries arise in close proximity to the cerebral, he considers that the thyroid gland acts as a diverticulum to the cerebral circulation, exercising at the same time its secreting function in an alternating manner with the brain.

Little need be said here regarding the diseases of this organ, as the most important of them, bronchocele or goiter, has been already described under the latter title.

THYRSUS, in botany, a panicle (q.v.), in which the flower-stalks are short, and the flowers are thus close together, so that the panicle is dense. It is a very common form of inflorescence. The use of the term is, however, somewhat vague.

THYSANURA, an order of wingless insects of small size, and which undergo no metamorphoses. They are furnished with peculiar organs, either along their sides or at the extremity of the abdomen, which, as well as the legs, are used for locomotion. The

whole order is comprised in two families—*podurida*, or spring-tails (see *PODURA*), and *leptismida*. The *leptismida* have an elongated body, covered with small shining silvery scales. The abdomen is furnished on each side with a series of movable appendages; it has also at its extremity a compressed appendage of two pieces, and three jointed bristles, which are used in leaping. The *leptismida* inhabit dark and moist places, as behind window-shutters, beneath planks, etc.; many of them often in the interior of houses.

TI, *Cordyline ti*, formerly *dracena terminalis*, a plant of the natural order *liliaceae*, and nearly allied to the dragon tree. See *DRAGON'S BLOOD*. It is found in the s.e. of Asia, the eastern archipelago, the Sandwich islands, and many other island groups of the Pacific ocean. It attains a height of 10 or 12 ft., sometimes more, with a tree-like form, lanceolate leaves of a reddish hue, and branching panicles. The fruit is a three-celled and three-seeded berry. The leaves afford food for cattle. They also form durable thatch for houses. Their fibers are sometimes made into cloth. It is most valuable, however, for its root, which is very large, and when raw, is hard, fibrous, and almost insipid; but becomes soft and sweet when baked—is very nutritious, and much used as an article of food. Good sugar is also made by evaporating its juice; the fermented juice is used as an intoxicating beverage, and a kind of ardent spirit is distilled from it.

TIAHUANUCO, an elevation of land over 12,000 ft. high in Bolivia, 38 m. n.w. of La Paz, on lake Titicaca, supposed to have been an island in the lake at some remote period, and containing some remarkable ruins, formed of beautifully carved blocks of stone, of gigantic size, many of them joined together with bronze, and giving no clue to their age, though evidently antedating the incas. One theory makes it a place of worship of an ante-historic race, and not an inhabited place.

TIA RA, the triple crown of the pope, which is considered to be symbolical of his temporal, as the keys are of his spiritual authority. It is composed of a high cap of gold cloth, encircled by three coronets, with a mound and cross of gold on the top. From the cap hang two pendants, embroidered and fringed at the ends, and *semée* of crosses of gold. The original papal crown consisted of the cap alone, and was first used by pope Damasus II., 1048 A.D. The cap was surrounded with a high coronet by Boniface VIII. in 1295; the second coronet was added in 1335 by Benedict XII.; and the third by John XXIII. in 1411.

TIBER, the chief river of central Italy, and the most famous in the peninsula, rises from two springs in a wood of beech trees in a dell of the Tuscan Apennines (province Arezzo), about 6 m. n. of the village of Pieve-San-Stefana, and in lat. about 43° 45' north. Its course until it reaches Perugia is s.e.; thence, as far as Rome, it pursues, along an irregular zigzag line, a southern direction; but when it enters the plain of the Campagna, it curves to the s.s.w., and enters the Mediterranean by two branches, which inclose the Isola Sacra. The entire course of the river is about 260 miles. The most celebrated towns on or near its banks are Perugia, Todi, Orvieto, Rome, and Ostia; and its chief affluents are the Nera (anc. *Nar*), and Teverone or Aniene (anc. *Anio*) from the left, and the Chiana from the right. In the upper portion of its course, from its source to the city of Orvieto, it is rapid and turbid, and of difficult navigation. It is regularly navigable for boats of 50 tons to the confluence of the Nera, 100 m. from its mouth, and small steamers ascend to within 7 m. of that point. Wine, corn, charcoal, wood, and other produce from the interior are conveyed by the Tiber to Rome. Within the walls of Rome (q.v.), the width of the river is 300 ft., and the depth from 12 to 18 feet. Of its two mouths, the northern, the Fiumicino, is the channel of commerce; the southern, the Fiumara, is useless for commercial purposes, owing to the accumulation of sand at its mouth. The Tiber is supplied mostly by turbid mountain torrents, whence its liability to sudden overflows of its banks; even the oldest Roman myth, that of Romulus, being inseparably associated with an inundation. Its waters, too, are still discolored with yellow mud, as when Virgil described it—

Vorticibus rapidis et multa flavus arena.

TIBERIAS. See GALILEE.

TIBERIAS, SEA OF. See GENNESARET.

TIBERIUS, (TIBERIUS CLAUDIUS NERO CÆSAR,) the second emperor of Rome, was the son of Tiberius Claudius Nero, one of the active partisans of Pompey and Antony in the war of the second triumvirate, and of Livia, a descendant of Appius Claudius Cæcus, and was born Nov. 16, 42 B.C. The triumvir, Octavianus Cæsar (afterward the emperor Augustus) having become enamored of Livia, the complaisant husband divorced her, and, though then pregnant with Drusus, she was immediately espoused by Octavianus (38 B.C.). Tiberius being now one of the imperial household, received a careful education, was allowed by Augustus the same public honors as were paid to his nephew and grandsons, and as well as his brother Drusus, was employed in active service at the head of the legions on the outposts of the empire. Tiberius was at this time in favor with the emperor and the Roman people, chiefly because his retired mode of life and subordinate position restrained his evil propensities; and his praises as a military leader were loudly sounded, though the character of his opponents was not such as called for the display of very great warlike ability. At the command of Augustus, he unwillingly divorced his wife, Vipsania Agrippina, to marry the emperor's daughter Julia (11 B.C.); but disgusted

at her open profligacy, he gladly accepted a command on the German frontier, and afterward (6 B.C.) retired to Rhodes, where he lived for seven years, returning after Julia's banishment to Pandataria. The death of two of Augustus's three grandsons paved the way for the adoption of Tiberius, and of the third grandson, Agrippa Postumus, by the emperor, and for the appointment of Tiberius as heir to the throne, Agrippa being, apart from his youth, wholly unfitted for the exercise of uncontrolled authority. Accordingly, Tiberius ascended the throne (14 A.D.), and by his manly and graceful demeanor, prudence, and moderation, gave promise of a happy reign. His mild and benignant sway at first was doubtless due in part to the necessity of outbidding his popular nephew Germanicus (who was of Octavian blood by his mother's side) for public favor; but after his kinsman's death (19 A.D.), and the removal of all who were likely to put forth claims to the throne, Tiberius's true character became better known. He had always shown himself reserved, jealous, timid, and irresolute, though not cowardly, and almost devoid of sympathy and affection; and with the scepter firmly in his grasp, the development of these qualities produced the most suspicious and cruel of tyrants. During the life of his mother, however, Tiberius, who held her somewhat in dread, took little share in the government, but led a retired life, attempting to ape the virtues he had not. The chief events of this part of his reign were the increase in number and amount of the taxes, the removal of all power from the people and the senate, and the institution of prosecutions for *læsa majestas*, the latter being nothing else but a convenient mode of removing all who incurred the displeasure of the emperor. But after Livia's death (29 A.D.), he resigned the whole real authority into the hands of Ælius Sejanus, a Roman knight and a commander of the prætorian guards, and gave himself up to the unrestrained indulgence of his sensual appetites. The empire did not suffer by the change, for Sejanus was a man of great ability and resolution, and well knew how to maintain his ascendancy over the emperor by pouring into his suspicious ear tales of conspiracy, and then allaying the imperial fears, and satisfying his own private enmities by the condemnation for *læsa majestas* of eminent Roman citizens. In 26 A.D., Tiberius retired to the island of Capri, there to wallow in his brutish enjoyments with more freedom, leaving Sejanus, whom he made his coadjutor in government, and equal in position, at the head of the government; and from this period till the discovery of the ambitious aspirations of Sejanus, and his downfall (31 A.D.), the Roman annals are crowded with proscriptions at Rome, and infamous excesses at Capri. Sejanus's successor, Macro, had all his vices, and few or none of his talents, and so the state of affairs was even worse than before, the senate exhibiting a rare degree of sycophancy, by indorsing with the most accommodating promptitude every order, however tyrannical, of the emperor or his confidant. It may seem strange that this frightful misgovernment by an aged debauchee and his ignoble favorite should have been so quietly submitted to by the Romans, but in reality their tyranny was confined exclusively to those of rank, the common people being treated with forbearance and occasional liberality, as there was nothing to fear from them. Tiberius's powerful constitution was at last completely destroyed by his excesses, and falling sick at Astura, he traveled to Misenum, where, in the villa of Lucullus, he ended his infamous life, Mar. 16, 37 A.D., his death being hastened a few days either by poison or suffocation.

TIBET. See THIBET.

TIBIA (Latin, "shin-bone"). In *anatomy*, the larger of the two bones forming the fore-leg, and the one to which the fibula is attached. In *music*, the Tibia was the commonest musical instrument of the Greeks and Romans, and was a pipe or flute, originally made of bone, but later of a reed growth, with the opening at the top, protected by a natural knot, with a tongue beneath, partially detached by a longitudinal slit. It was used at festivals, sacrifices, dances, as an accompaniment to the rowing of the trireme, sometimes also to the march of troops to battle. The *tibia dextra* was held in the right hand, *bass*, the *tibia sinistra* in the left, *treble*; *tibiae pares*, both treble or both bass, and the *impares*, one of each.

TIBULLUS, ALBIUS, the Roman elegiac poet, was born of equestrian family, probably 54 B.C., and died young, not long after Virgil, about 18 B.C. We know nothing of his youth or education. From his equestrian ancestors he inherited an estate at Pedum, between Tibur and Præneste, which, like the estates of Virgil and Horace, had been either wholly or partially confiscated in the civil wars. Tibullus, however, recovered part of his property, and spent upon it the best part of his short life. He was patronized by Messala, whom, in 31, he accompanied into Aquitania, to suppress a serious revolt which had broken out in that province. He was present at the battle of Atax, which gave the final blow to the insurgents; and he celebrates in a fine strain of poetry, the honorable part he bore in the campaign. Next year, Messala was sent to the East and again Tibullus accompanied him; but having been obliged from illness to stop at Coreyra, he returned to Rome. At this point, the public life of Tibullus ceases; and henceforth he devoted himself to the study and composition of poetry. His *Elegies*, divided into four books, are mainly addressed to his mistresses, Delia, Nemesis, and Glycera, whose inconstancy or coldness he bewails in tender and exquisitely finished verses. The third book, however, is now believed to be the work, not of Tibullus but of another and inferior poet; while the hexameter poem on Messala, with which the fourth book opens, is from inter-

nal evidence, supposed to be also by another and inferior hand. Only the first book was published during the poet's lifetime, which, brief as it was, yet passed peacefully away amid all the blessings of pecuniary competence, patronage of the great, health, and fame. The character of Tibullus was singularly pure, amiable, and winning. During life, he had the honor of being addressed in an ode and epistle by Horace; after death, of being bewailed in an elegy of matchless beauty by Ovid. The best edition of his poems is L. Müller's (1882). They were translated into English by Grainger (1752) and Cranstoun (1872).

TIBUR. See **TIVOLI**.

TIC DOULOUREUX. See **NEURALGIA**.

TICHBORNE TRIAL, a celebrated conspiracy case in the legal records of England, in which an impostor, who assumed the identity of an heir to claim his estate, was found guilty and sentenced to fourteen years' penal servitude. Roger Charles Tichborne was born in 1829, and after his education in France and at the Roman Catholic college of Stonyhurst, he entered the English army in 1849. In 1852 he offered to marry his cousin Kate, the daughter of his uncle, sir Edward Tichborne; but failing to obtain the consent of her parents, resigned his commission, sailed for Valparaiso, and in 1854 left Rio de Janeiro on board the ship *Bella* which was lost at sea. Sir Edward Tichborne died in 1853, and was succeeded by his brother James. The latter died in 1862, and as his eldest son Roger was supposed to be lost on the *Bella*, he was succeeded by his second son Alfred, who lived only till 1866. A posthumous son was born three months after the death of Alfred, and was accepted as the heir to the Tichborne estates. In 1865 Lady Tichborne, widow of Sir James, advertised in English and Australian newspapers for her son Roger, whom she believed to be living. In 1867 a butcher of Wagga Wagga, Australia, where he was known as Thomas Castro, sailed for Paris, and was accepted by lady Tichborne as her son Roger; although nearly every other member of the family considered him an impostor. He found, however, many adherents, and traveled about England to secure witnesses and obtain information concerning incidents in the life of Roger Tichborne. In 1867 he filed a bill in chancery to restrain the trustees of the estates from setting up certain outstanding terms as an answer to any action he might bring to recover the property. The trial was delayed for nearly four years by various causes, especially by sending commissions to Australia and South America. Lady Tichborne died in 1868, but there were so many persons who believed in the claimant that he was able to borrow large sums of money to pay the expenses of the trial, which was commenced in 1871. It continued for 103 days when the jury declared themselves satisfied that the claimant was not Roger Charles Tichborne, and he was nonsuited. He was then imprisoned to be tried for perjury, but was released on bail. His trial for perjury was begun in the court of Queen's Bench in 1873, and lasted 188 days, till Feb. 28, 1874, when he was found guilty and sentenced to fourteen years' penal servitude. The career of the claimant was traced from the time he left England to the time of the trial, and it was clearly shown that his real name was Arthur Orion, a native of London, who emigrated to Australia where he assumed the name of Thomas Castro. He was entirely ignorant of incidents in the life of Roger Tichborne during his residence in France, and knew no French, which Roger spoke more fluently than English. His handwriting was entirely different, and he was very illiterate, while Roger had been well educated. It was also proved that he did not resemble Roger in his physical appearance. In consequence of the trials the trustees were obliged to mortgage the Tichborne estate. See *Charge of the Lord Chief Justice in the Case of the Queen v. Castro* (London, 1875). T. was released, Oct., 1884.

TICHVIN', a t. of Great Russia, in the government of Novgorod, 168 m. e.s.e. of St. Petersburg, on the Tichvinka, which, together with the canal of the same name, connects the Volga with the Baltic. It contains four churches, 2 convents, and 2 banks. The inhabitants are chiefly employed in the transit-trade by land and water. Pop. '93, 6650.

TICINO, a river of Switzerland and the n. of Italy, rises on the southern slopes of Mt. St. Gothard, and flows s. through lake Maggiore, and s.s.e. through the n. of Italy to its junction with the Po, about four m. below Pavia. Entire length about 150 m.

TICINO, the most southern canton of Switzerland, bounded on the w. and s. by Italy, and on the e. by Italy and the canton of Grisons. Area, 1088 sq. m.; pop. '94, 127,940. Its surface, forming a portion of the southern slope of the Alps, comprises lofty mountains in the north. The northern boundary between Ticino and the cantons of Uri and Grisons is a range of the Lepontine Alps, rising in Mt. St. Gothard (q. v.) to the height of about 12,000 feet. There is considerable dairy farming and cattle breeding; there is some agriculture, and grapes, figs, olives, almonds and melons are raised. Offsets from the Lepontine and Rhetian Alps occupy the greater part of the canton. In the south the country falls away into flats, and the scenery becomes Italian in character. The principal river is the Ticino (q. v.).

TICK, the popular name of a great number of *acarides* (see **ACARUS**), forming a section called *suctoria*, having the mouth in the form of a sucker, with no apparent mandibles. They live by sucking the juices of plants and animals. Some of them are

aquatic. The harvest-bug (q.v.) is a well-known example of the suctorial *acarides*. It belongs to a family called *leptidae*. The name *Ticino* is more particularly given to the family *iodidae*. They abound in almost all parts of the world, but chiefly in warm countries, in which they are very troublesome pests. Many of them live in woods, attached to branches, but are ready to attach themselves to animals, which sometimes suffer greatly from their numbers, their blood-sucking powers, and the inflammation which they cause. The *tampan* (q.v.) is a very troublesome tick of s. Africa. The carapata of Brazil is scarcely less annoying. It infests dry bushy places, clusters of many hundreds being found clinging to very slender twigs, and they instantly transfer themselves to any horse, ox, or other quadruped which comes in contact with them, burying their serrated suckers in its skin, so that they cannot be withdrawn without considerable force. If not taken off, they go on increasing in size, till they become as large as a horse-bean, or even larger. Whole herds of cattle sometimes perish from the exhaustion which they cause. Wet weather, however, soon kills them, and an animal made to swim across a river, is almost freed from them at once. Travelers in the interior of Brazil are sometimes obliged to pick hundreds off their own bodies before retiring to rest for the night.—The Dog Tick (*Ixodes plumbeus*) is common in Britain, abounding on ferns in fir plantations, etc., in many places in autumn, and attaching itself to dogs, oxen, and other animals, sometimes even to man. It is in form and size like a grain of linseed, oval, shining, reddish, with a pale margin. The body swells to the size of a small horse-bean after the tick has attached itself to an animal, and the wound is attended with much inflammation and pain. Tortoises have ticks peculiar to them, which adhere to their neck, and by the thickness of their leathery coat, are preserved from being crushed when the head is retracted. See *illus.*, INSECTS, vol. VIII.

TICKELL, THOMAS, 1686-1740, b. England; educated at Oxford, where he was appointed fellow in 1710. He attracted the attention of Addison by some lines praising the latter's *Rosamond*; and Addison, becoming sec. of state in 1717, made him under-secretary. He was sec. to the lord justices of Ireland from 1725 till his death. He published *Prospect of Peace* (1713); *The Royal Progress* (1714); and a poetical version of the 1st book of the *Iliad* (1715). His best known poem is *Colin and Lucy*. Goldsmith calls his *Elegy on Addison* "one of the finest odes in our language."

TICKET OF LEAVE is a term which is properly applied only in regard to convicts in the Australian colonies. A kind of permit was given to them after a certain period of their sentences, if they could be trusted at large. It required the convict who held it to remain within a particular district. The term was afterward popularly applied to the kind of document called technically an "order of license," which sets a convict at large in the British empire before the expiry of his sentence. The occasion of its being first used was when, after the year 1840, the colonies, one after another, refused to receive convicts. If those sentenced to transportation were kept in prison in this country for the whole period of sentence, its severity would be greatly increased; and hence, by way of compensation to the convicts not taken abroad, part of their sentence was remitted. On the form of the sentence being recently changed from transportation to penal servitude, the partial remission was made systematic, as an inducement to good conduct and industry. Under the existing act of 1864, the period of remission which may thus be gained, is for males about a fourth, and for females about a third, of the whole sentence. The method of adjusting the period is by debiting the convict with so many marks, representing the amount of industry that must be accomplished to gain the largest period of remission; and according to the proportion of these gained is the amount of remission or order of license or ticket of leave. See **CONVICT**; **PRISONS**.

TICKING, a strong cloth, used chiefly for making beds, mattresses, and paillasses. Formerly, it was always manufactured of linen, but cotton is now largely used for this purpose. A very general character of ticking is that it is woven in stripes of two colors, blue and white.

TICKNOR, FRANCIS ORRERY, physician and poet, was born in Baldwin Co., Georgia, in 1822. He studied medicine in Philadelphia and New York, and went to Columbus, Ga., to practice, where he died in 1874. He wrote many poems, especially during the civil war, which were published after his death by Paul H. Hayne. Among these may be noticed "Little Giffen" and "The Virginians of the Valley."

TICKNOR, GEORGE, an American scholar and author, born in Boston, August 1, 1791; educated at Dartmouth College; admitted to the bar in 1813, but devoted himself to literature. From 1815 he spent four years in Europe, residing at Göttingen, Rome, Madrid, Paris, Edinburgh, and London, where he made the acquaintance of the most distinguished men of letters. Returning to America, he became professor of French and Spanish languages and literature in Harvard university. In 1835, resigning his professorship, he went with his family to Europe, where he remained three years, collecting materials for his *History of Spanish Literature* (New York, 1849, 3 vols. 8vo), an exhaustive and admirable work, which has been translated into Spanish and German. Mr. Ticknor also edited *The Remains of Nathaniel Appleton Haven*, and wrote a *Life of Lafayette*, first published in 1824 in the *North American Review*. He published in 1864 a biography of his friend, W. H. Prescott, the historian. Mr. Ticknor died in 1871. See *Life, Letters, and Journals of George Ticknor* (Boston, 1876).

TICONDEROGA, a town and village in Essex co., N. Y.; on lake Champlain and the Delaware and Hudson and the Rutland railroads; 90 m. n. of Albany. The falls of the outlet of lake George, 150 ft. in $1\frac{1}{2}$ m., afford constant water-power for manufactories of paper, pulp, graphite, air engines, blank books, paint, machinery, and other articles. The promontory was fortified by the French in 1755. In 1757 Montcalm assembled here a force of 9000 men, with which he took the English fort, William Henry, on lake George. In 1758 General Abercrombie with 15,000 men attempted to storm the French fort, then called Carrillon, but was repulsed with a loss of 2000. In 1759 it was invested by General Amherst, and the French dismantled and abandoned both this fort and Crown Point, which were then enlarged and strengthened by the English at a cost of \$2,000,000. Being weakly garrisoned after the cession of Canada to Great Britain, it was, in 1775, surprised and captured by Ethan Allen. In 1777 it was recaptured by General Burgoyne, by erecting a battery on an unprotected height which commanded it; but after the surrender of Burgoyne, it was dismantled and abandoned. It was again occupied by the British troops in 1780, and at the close of the war became a picturesque ruin. Pop. '90, town, 3980; village, 2267.

TIDAL WAVES are on record as early as B.C. 4th c. Such waves are generally attributed to some violent convulsion of the earth, inasmuch as they are nearly always preceded by an earthquake. Perhaps the most noted is that of Lisbon, which occurred in 1755; immediately after the earthquake a wave 60 ft. high came in from the sea. For its extent and height, the wave that succeeded the earthquake at Arica, on the w. coast of South America, in 1868, was one of the most remarkable. The sea at first receded, then came back in a great wave estimated to be more than 40 ft. high. It landed one of the U. S. war ships high up on the shore. It reached South California, 5000 m. distant, in a few hours, extended to Yokohama, Japan, and to the shores of Australia. Large waves have also been noticed upon the great lakes.

TIDE-MILL. See WATER-POWER.

TIDES. It was known, at least as early as the time of Cæsar, though probably long before, that the time of high-water, and also the height of the tide, are in some way connected with the age of the moon. And even in the present state of science, what is called the *establishment* of a port, or the time of high-water at new or full moon (that is, the interval between the moon's crossing the meridian and the full tide), which is practically the most important part of the whole question, cannot be predicted by theory, but must be obtained by observation. The first attempt to explain the phenomena of the tides was made by Newton; and, considering the little that has, since his time, been effected, his approximate solution must be pronounced highly creditable, although in many respects unsatisfactory. D. Bernouilli and others have since slightly improved Newton's method; and a complete solution of the problem has been attempted by Laplace. The principles involved in this solution are undoubtedly correct, and the result, so far as it goes, leaves little to be desired. But it does not go far, for two reasons: we know very little as to the depth of the sea; and, even had we that knowledge, the excessive difficulties of the mathematical processes required in taking account of it, and of the forms of continents and islands, would make this method inapplicable.

Newton's approximate method consists in the study of the problem as a *statical* one, and this we will presently describe. Laplace, on the other hand, treats the problem as one of *fluid motion*. Airy and others have, more recently, attempted, with success, to simplify Laplace's process. Curiously enough, however, the results of all these theories are very much alike; and, while some of the results agree well with observation, others seem irreconcilable with it. We cannot explain Laplace's method without employing high analysis, quite unsuited to this work; so we must be content to describe the faulty theory. In the Newtonian or *equilibrium* theory, we consider the earth to be spherical, and covered with a layer of water, which would, of course, if left to itself, be uniformly deep over the whole surface. The attraction of the moon (per unit of mass) on the water immediately below her, is greater than her attraction on the solid earth (per unit of mass), and tends, therefore, to raise the water at that part of the surface. At the point of the surface directly opposite to the moon, the water-layer is further from the moon than the bulk of the earth, and, consequently, the moon attracts the water (per unit of mass) *less* than it attracts the earth. The tendency is, as it were, to pull the earth away from the water, so that here also the water is raised, though not *quite* so much as on the other side, as the moon's attraction diminishes with distance. The effect of the moon's action on the previously uniform layer of water is thus to elongate it both ways in the direction of the line joining the centers of the earth and moon. On account of the very small amount of this elongation, it is found by mathematical processes, which we cannot give here, that the form of the surface will become very nearly a prolate spheroid (a solid formed by the revolution of an ellipse about its *longer* axis).

[Before proceeding further with our explanation, it is necessary to say a few words with reference to a mistake often fallen into by those whose knowledge of mechanics is scanty; and at times paraded with a show of learning by a class of men who doubt such plain matters of fact as the moon's rotation, the oblateness of the earth, the inertia of matter, and what not. Such people say that, since, if the moon and earth were rigidly fixed to each other, the water would rise only on the side next the moon, this must be the case in nature also. This is the same mistake as those commit (see PERTURBATIONS)

who allow that at new moon the sun virtually diminishes the moon's gravitation toward the earth, but refuse to allow that the same is true at full moon.]

We have next to consider that the moon revolves about the earth, and that the earth also revolves about its axis. Thus, the equilibrium figure has never time to form; but an imperfect form of it travels round the earth in the time of a lunar day (24 hours 54 minutes). If the moon be on the equator, it is obvious that similar portions of the water-spheroid will reach any one spot on the earth at intervals of half a lunar day (12 hours 27 minutes). If the moon's declination be considerable, such will not be the case—a place, for instance, whose latitude is equal to the moon's declination, will be reached by one pole of the wave-spheroid when the moon is on the meridian; but in 12 hours 27 minutes, the other pole of the spheroid will not pass over the place, but at a meridian distance of twice the latitude of the place, or twice the moon's declination. Thus, when the moon's declination is sensible, the two tides of each day are not generally equal in height, except for places on the earth's equator. This gives rise to what is called the *diurnal* tide, which is, as it were, superposed upon the ordinary, or *semi-diurnal*, tide, and ought to be more sensible as the latitude is greater. Owing to fluid friction, and other causes, we should expect that the axis of the tidal spheroid would lag a little behind the moon, and this is found to be the case.

So far, we have a general explanation of the occurrence of tides twice a day, and of their dependence on the moon. But we started with two assumptions which are not consistent with fact, viz., that the earth is spherical and uniformly covered with water, and that the moon is the only tide-producing body. The corrections to be made in consequence of the inaccuracy of these assumptions must now be explained. We commence with the latter. The sun, although at an immense distance compared with that of the moon, has such an enormous mass, that his tide-producing influence is comparable with that of the moon. In fact, it is easy to see that, as Newton showed, the tide-producing power of an attracting mass is directly as the mass, and inversely as the *cube* of its distance. That it is directly as the mass, is obvious. To prove the other assertion, let R be the earth's radius, D the distance of the attracting body from the earth's center, then the attraction per unit of mass on the earth is to that per unit of mass on the water nearest the attracting body as

$$\frac{1}{D^2} \text{ to } \frac{1}{(D-R)^2},$$

according to the law of gravitation. The difference between these quantities is proportional to the tide-producing force. But

$$\frac{1}{(D-R)^2} = \frac{1}{D^2(1-\frac{R}{D})^2} = \frac{1}{D^2}(1 + \frac{2R}{D} + \text{etc}) = \frac{1}{D^2} + \frac{2R}{D^3} + \text{etc.}$$

the remaining terms being omitted, since D is always much greater than R . The difference is therefore approximately

$$\frac{2R}{D^3},$$

as stated above.

Now the mass of the sun is to that of the moon as 355,000 to 0.0125, and the sun's distance is about 400 times that of the moon. Hence the tide-producing power of the sun is to that of the moon as

$$\begin{aligned} &355,000 \text{ to } .0125 \times 400^3 \\ &\text{or } 355 \text{ to } 800. \end{aligned}$$

By calculations, which we cannot give here, it has been shown that the difference of length of the axes of the wave-spheroid produced by the moon alone is about 58 inches; so that in that due to the sun it will be about 25.7 inches.

In consequence of the extremely small amount of these effects on the sea-level, we are entitled to simply add or superpose the separate effects of the sun and moon, in order to obtain their joint effect. And now we have at once the explanation of what are called *spring* and *neap* tides. At new and at full moon, the wave-spheroids due to the sun and moon have their axes almost coincident, so that we have a tide which is to the lunar alone as $800 + 355$ to 800, or as 13 to 9 nearly; while, when the moon is in her first or last quarter, the axes are nearly at right angles, and the compound tide is to the lunar tide alone as $800 - 355$ to 800, or as 5 to 9 nearly. Thus the height of the spring-tide is to that of the neap-tide in the ratio of about 13:5.

Another curious phenomenon, which we can now easily account for, is the "priming" and "lagging" of the tides, or the *acceleration* and *retardation* of the time of high-water. If the tides were due to the sun or moon alone, they would recur at equal intervals of time; and, in fact, this is the case with the lunar and solar tides separately. But what we observe is the compound tide, and this will obviously have its maximum *between* two consecutive maxima of the lunar and solar tides; but nearer to the lunar tide as it is the greater. Thus, if about new moon the sun passes the meridian *before* the moon, the tide is accelerated; if *after*, it is retarded. And the same is true about full moon, only

that in this case our statement refers to passages of the sun and moon on opposite sides of the meridian. This retardation or acceleration has for its greatest value a period of rather less than an hour; and the respective maxima occur about $4\frac{1}{2}$ days before and after the spring-tides.

But we meet with far more serious difficulties when we come to consider the actual distribution of water over the earth's surface; and it is here that future improvements must be looked for.

But even so inadequate an attempt at a solution as is the equilibrium theory, gives us the means of explaining a great many curious observed phenomena. It shows, for instance, how exceedingly small we should expect to find the tides in an inland sea such as the Mediterranean; for there, even when the moon is most favorably situated, the utmost difference of level would be (by calculations which we cannot give here) only about an inch or two; and of this part would be the rise in one portion of the sea, the rest the fall in others. The popular explanation of this phenomenon is very simple. We have but to notice that, according to the equilibrium theory, the form of the water is a spheroid of definite dimensions, its axes differing from each other by 58 inches. But a small portion of such a spheroid (of the dimensions of the Mediterranean, for instance) can hardly be distinguished from a sphere; so that the form of the surface of a limited mass of water will be but slightly altered by the attractions of the sun and moon.

It is obvious from what we have just said, that the rise of the water in tidal rivers, estuaries, and deep bays, where it sometimes amounts (even in calm weather) to more than 100 ft., cannot possibly be due to the moon's action upon the water of the mere river or bay, but must be almost entirely produced by the tidal wave in the ocean; and, in fact, this part of the problem presents comparatively little difficulty. Once grant the fact of the tidal disturbance of sea-level at the mouth of a river, and the calculation of the motion of the consequent wave in the river-channel is within the power of mathematics. It is by means of investigations made from this point of view, and by others concerning the effect of the moon on long canals, that Laplace's method has been improved. For the details of the process, see Airy on "Tides and Waves," in the *Encyc. Metrop.* All we can do here is to point out a few of the immediate consequences of the periodic rise and fall of the sea-level as regards the motion of the water of a tidal river. Here the tide always runs *up* the river, even when, as in the case of the Severn, this is the opposite direction to that in which the moon appears to move. In the open sea at the mouth of the river, the interval from high to low-water is almost exactly equal to that from low to high-water, each being about $6\frac{1}{2}$ hours nearly. But the further we go up the river, the greater becomes the disparity between these periods, high-water following low-water at shorter and shorter intervals, while the intervals during which the tide falls are correspondingly increased. In some cases, as at certain points in the Seine and Severn, the interval from low to high-water is so short that the tide-wave rushes suddenly up, and spreading over the flat sands at the side of the channel, forms a dangerous surf called a *bore* (q.v.).

Connected with these peculiarities, there is also a singular effect produced on the direction of the current in a tidal river. In the open ocean, the water merely rises and falls, there being no perceptible tidal current. Sailors are in the habit of associating the cessation of currents, or "slack" water, with the occurrence of high and low water. This is the case in bays, but not in rivers, and it gives rise to some curious errors regarding the time of high-water in rivers. Thus it is sometimes said that it is high-water in the center of the Thames' channel long after it is high-water at the shore—an obvious absurdity. The truth is, the current does not cease simultaneously at the shore and in the mid-channel. At the mouth of a tidal river, the water runs upward for hours after high-water, and downward after low; and the same is true, in a less degree, at places higher up the stream.

When considerable alterations of breadth or depth occur in the channel of a river, we find corresponding alterations in the amount of rise of the tide. Thus, according to Airy, at the entrance of the Bristol channel, the whole rise at spring-tides is about 18 ft.; at Swansea, 30 ft.; and at Chepstow, 50 feet. In the bay of Fundy, the tide is said to rise nearly 120 feet. Again, the same port may be reached by tide-waves coming from the ocean by different channels; and here we have to compound the two disturbances just as we did with the separate lunar and solar tides. In the German ocean, we have a very good example; but the most remarkable is the tide at Batsham, in Tonquin. At this port, two tide-waves meet, coming respectively from the Indian and China seas; these bring, simultaneously, opposite but nearly equal changes in the water level, and the effect is, that there is almost no perceptible tide.


Whewell, Lubbock, and others have lately added much to our knowledge of the *facts* of the tides: and have constructed what are believed to be tolerably accurate charts of *cotidal lines*—that is, lines representing the positions of the crest of the tide-wave at hourly intervals as it sweeps round the earth. A great deal, however, remains to be done in this direction, before we can hope to elicit from observation such hints as may enable us to improve the mathematical theory of the subject.

The frictional resistance to the motion of the tide-wave of course produces heat. This heat is a transformation of part of the earth's energy (see *FORCE*) of rotation; and thus it

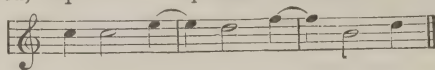
appears that the tides are gradually lengthening the day. We may see easily that this would go on, were the moon the only tide-producing body, so long as the earth rotates about her axis in less time than a lunar month. For if the length of the (sidereal) day were that of a lunar month, the earth would always turn the same face to the moon; and the tide-spheroid would have a *fixed* position on the earth, and there would be no loss of energy by friction. Simple as this deduction is, though it seems to be roughly guessed at by Kant, it was not formally enunciated till about thirty-five years ago. Mayer was the first to publish anything on the subject, but it seems to have been previously noticed by others. One of the most curious deductions from it is the recent speculation which assigns, as the cause of the moon's turning always the same face to the earth, the friction of the enormous tides which must have been produced by the earth in her mass when it was in a molten state, on the surface at least, if not throughout.

For tidal evolution and the theory, based on Dr. G. H. Darwin's calculations, that in early geologic times the size of the tides was vastly greater than at present (owing to the greater nearness of the moon), see *Nature*, vols. xxv., xxvi.

TIE, in music, an arch drawn over two notes on the same degree, uniting them so that they are played or sung as one single note of the same value. Thus, for the two C's

written in the example , one is played of the value of a minim and

quaver combined. The tie is often used in syncopated passages to connect the last note of one measure with the first of the succeeding one, when the former note, which would otherwise be unaccented, acquires the emphasis of the latter :



See SYNCOPATION.

TIE-BEAM. See ROOF.

TIECK, CHRISTIAN FRIEDRICH, 1776-1851; b. Berlin; studied sculpture under Schadow in Germany, and David in France; was employed at Weimar, 1801-5, and afterward in Italy; became a professor of the Berlin academy, 1820, and was engaged with Schenkel and Rauch in improving the art. He executed at Carrara many busts in the Wallhalla for the crown prince Louis of Bavaria; at Weimar those of Goethe and other poets; a statue of Neckar for Mme. de Staël; of his brother at Dresden, and decorations of the royal theater at Berlin, and other public buildings.

TIECK, LUDWIG, a brilliant and prolific German novelist and poet, was born at Berlin, May 31, 1773, and studied at the universities of Halle, Göttingen, and Erlangen. He made his first appearance as an author in the *Straussfeder* (Ostrich-feather) magazine, conducted by Musäus (q.v.) and J. G. Müller, for which he wrote a series of little tales, of which the best was *Die beiden Merkwürdigsten Tage aus Siegmann's Leben* (The Two most Remarkable Days in Seigmann's Life). But the originality of his genius first displayed itself in his romances of *Abdallah* (Berl. 1796) and *William Lovell* (3 vols., Berl. 1795). These were followed by his *Peter Lebrecht, eine Geschichte ohne Abenteuerlichkeiten* (Peter Lebrecht, a History without Adventures, 2 vols., Berl. 1795-96), and *Peter Lebrecht's Volksmärchen* (3 vols., Berl. 1797), which were equally remarkable for richness of fancy, artless simplicity, and an overflowing humor. In some of these *Märchen*, as, for example, his "Bluebeard," "Puss-in-Boots" (*Der gestiefelte Kater*), and "The Life and Death of Little Red Riding-hood" (*Leben und Tod des kleinen Röthkappchen*), he combated with satiric humor, perhaps, too, with somewhat of youthful arrogance, the "enlightened" notions on which the literature of the 18th c. prided itself—showing very distinctly his strong tendencies toward the deeper poetic spirit of the middle ages. The same polemic was maintained in his comedy, *Die verkehrte Welt* (The Topsy-turvy World, 1799). To this period also belong his *Herzensergüssungen eines kunstliebenden Klosterbruders* (Heart-effusions of an art-loving Monk, Berl. 1799), *Franz Sternbald's Wanderungen*, an art-novel (2 vols., Berl. 1798), and *Phantasien über die Kunst* (Fancies on Art, Hamb. 1799), all of which are full of a noble enthusiasm for art, but pervaded at the same time by a dreamy mystical religiosity, which is no longer admirable. These works brought Tieck into close relationship with A. W. von Schlegel and others, and led to the establishment of the literary sect or coterie known as the "Romantic school," whose influence on the later literature of Germany and France has been very great, and not always very good. Tieck now married the daughter of a Hamburg clergyman who had been a friend of Lessing; and in 1799 went to Jena, where he added Steffens to the list of his friends. Here he published his famous *Romantische Dichtungen* (2 vols., 1799-1800). His translation of *Don Quixote* (4 vols., Berl. 1799-1801, 3d ed., 1831) far surpassed all previous attempts. In 1802 he joined A. W. von Schlegel in the *Musen-Almanach*; and in 1804 published his longest romance, *Kaiser Octavianus*. Tieck's health now began to fail him, and in 1805 he visited Italy. On his return to Germany, he settled, after some changes, at Ziebingen in 1811, where he formed a friendship with the philosopher Solger, who exercised a great influence over his mind. Henceforth we find less of the dreamy

and formless mysticism of his earlier years, and more of the artistic element. The change becomes visible in his *Phantasm* (3 vols., Berl. 1812-17), and in his *Ulrich's von Lichtenstein Frauendienst* (Tüb. 1812). In 1817, along with a friend, Burgsdorf, he paid a visit to England, where he collected fresh materials for his Shakespeare. From 1819 to 1840 he resided at Dresden; but on the accession to the throne of Friedrich Wilhelm IV. of Prussia, he was invited to Berlin, whither he proceeded, and where he resided for the rest of his life. His death occurred April 28, 1853. Other important works of Tieck's, besides those already mentioned, are his *Novellenkranz* (Berl. 1831-35; complete in 12 vols., Berl. 1853), in which there is hardly a trace of the credulous romanticism of his earlier years, but abundance of lively and subtle talk on the literature and life of the present; *Dramaturgische Blätter* (2 vols., Bresl. 1826), republished in his *Kritische Schriften* (4 vols., Leip. 1848-52); *Shakespeare's Vorschule* (2 vols., Leip. 1823-29); and his splendid continuation of Schlegel's translation of our great poet. Tieck revised a collected but incomplete edition of his works in 20 vols. (Berl. 1828-46).—See Köpke's *Life of Tieck* (1855); Steiner, *Ludwig Tieck und die Volkbücher* (1893).

TIEDemann, Dietrich, 1748-1803; b. Germany; educated at the university of Göttingen. He was teacher of ancient languages at Cassel 1776-86, when he was called to the chair of philosophy at Marburg. His most important work is his *Geist der Speculativen Philosophie* (1791-96), containing the history of philosophy from the time of Thales. His other works, such as *Untersuchungen über den Menschen* (1777-98); and *Idealistische Briefe* (1798), contain interesting researches in psychology.

TIEL, the seat of an arrondissement in the Netherlands, province of Gelderland, is picturesquely situated on the right bank of the Waal. In the 5th c. it was called Tellum or Thiela. The fortifications have been demolished, and formed into beautiful walks. Pop. '89, 9896. Principal buildings are the town-house, court house, chamber of trade, and the great Reformed church of St. Martin.

TIENTSIN, a large and important city and river-port of China, in the province of Chihli, on the right bank of the Pei-ho, 35 miles from the mouth of that river by land, and 70 miles by the windings of the stream. It is the port of the city of Peking, from which it is distant 80 miles south-east. The streets are unpaved, and the houses, principally built of mud or dried bricks, have a mean appearance, though the central parts of the town are filled with well-built houses. Next to Peking it is the most important city of Chihli. The river is generally frozen over from about Dec. 15 to March 15, and the business, at other times carried on by means of boats and junks, is taken up by sledges, which swarm on the river. Pop. abt. 950,000.

TIEPOLO, GIOVANNI BATTISTA (also called **TIEPOLETTO**), an Italian painter, born at San Piero di Castello, near Venice, March 5, 1696. He studied under Lazzarini, and modeled his style chiefly upon that of Veronese, especially in his numerous wall and ceiling frescos. His most important works are the mural decorations in the archiepiscopal castle at Würzburg (the work of three years, comprising *Olympus and the four quarters of the globe*, and the *Life of Frederick Barbarossa*), the history of Anthony and Cleopatra at the Palazzo Labia in Venice, scenes from the Old Testament in the archiepiscopal palace at Udine, and frescos in the royal palace at Madrid. He died in Spain, March 27, 1770. See Molmenti, *Il Carpaccio ed il Tiepolo* (1885); Id., *Tiepolo, Acque Forti* (1896); Leitschuk, *Tiepolo* (1896).

TIERCE, TIERCE, in heraldry, a term of blazon used to indicate that the field is divided by lines into three equal parts. A shield may be tierce in pale, in fess, in bend, in bend-sinister, or in pall; all which, with other arrangements in tierce, are common in French heraldry. Tierce in pale, in English heraldry, is an occasional mode of marshaling three coats in one escutcheon under special circumstances.

TIERRA DEL FUEGO. See **TERRA DEL FUEGO**.

TIERS ÉTAT (Fr. third estate), the third branch of the French estates, which consisted of representatives of the trading inhabitants of the towns, and of the peasantry in the country. The *tiers état* played an important part in the opening scene of the revolution. On the two other estates of nobles and clergy refusing to join them and deliberate in a common chamber, they, on June 17, 1789, assumed the title of *assemblée nationale*, and the sole right to legislate for France. The French *tiers état* differed completely in its origin from the third estate or commons of England. The latter originated in the permission granted to the minor barons, instead of personally attending the national council, to appear by representatives; and with the representatives of the minor barons were joined in one house the representatives of the municipalities, which, as corporations, came to be considered in the light of tenants *in capite* of the crown. The designation "commons," and the absence of title, have often misled foreigners to suppose that the men who gained their liberties and constitution for the English people were the *roturiers* or *bourgeois*; whereas they mostly belonged to the class which would, in continental phraseology, be called the nobility of the country.

TIETJENS, or TITIENS, TERESA, one of the greatest of recent operatic singers. She was born at Hamburg, of Hungarian parents, in 1837, and made her *début* in that city in the character of Lucrezia Borgia in 1849, taking at once a very high position on the lyric stage: at Frankfort and Vienna she was even more warmly received; and her first appearance in London, in 1858, was quite a triumph. The great volume and purity of her voice, and her energetic but dignified acting, combined to make her an unrivaled representative of strong dramatic parts. She acquired great fluency and flexibility of

voice by hard practice. She was probably the hardest-worked singer that has appeared; and though this did not seem to injure her voice, it doubtless wore out her constitution. She died Oct. 3, 1877.

TIFFANY, a kind of very thin silk gauze.

TIFFANY, CHARLES COMFORT, D.D., b. Baltimore, Md.; educated at Dickinson coll., Andover theol. sem., and at the universities of Halle and Heidelberg; after some years in the Cong. ministry, was ordained priest in the Prot. Epis. church, 1866. He has held positions at Fordham, N. Y., Trinity church, Boston, Church of the Atonement and Zion church, New York; was chaplain of the 6th Conn. reg., U. S. vols., 1864-65. Dr. T. has written pamphlets on *Agnosticism*, *Modern Atheism*, *Rationalism* and *Romanism*, *Expression in Modern Architecture*, and *Norway and the Midnight Sun*.

TIFFANY, LOUIS COMFORT, artist, b. New York in 1848, studied in that city and in Paris, and traveled extensively in eastern lands. He was made a member of the Water Color Society in 1870, an academician of the National Academy in 1880, and treasurer of the Society of American artists in 1878. Since 1880 he has been prominently connected with the Society of Associated Artists in New York, which designs and furnishes interior decorations, stained glass, etc., for churches, residences, and public buildings. He has exhibited, among other easel paintings, "A Dock Scene, Yonkers" (1869); "The Hunter's Dinner" (1872); "A Merchant of the East" (1874); "The Cobblers of Boufarik" (1878); "Street in Algiers" (1889); "Potter's Market at Wurtzburg" (1891).

TIFFANY, OTIS HENRY, D.D., b. Baltimore, Md., 1825; graduated at Dickinson coll., Penn., 1844, and was received into the Baltimore Meth. Epis. conference, 1845. He was prof. of mathematics at Dickinson coll., 1850-57, and upon leaving was appointed sec. of the Maryland Bible soc. He has filled prominent stations in Baltimore, Chicago, Washington, Philadelphia, and New York, and has delivered numerous public orations, lectures, and addresses. In 1885 he was pastor of the Madison ave. Methodist church, New York.

TIFFIN. The Anglo-Indian name for luncheon, or for any light refreshment of food or drink. The word was long regarded as a corruption of the Arabic *tifanum* "pleasure," "recreation;" but Col. Yule, in his *Anglo-Indian Dictionary* (1885), shows it to be in all probability a transplanted English provincialism from the English verb "to tiff," meaning to drink or eat.

TIFFIN, city and co. seat of Seneca co., O.; on the Sandusky river, and the Baltimore and Ohio, the Cleveland, Cincinnati, Chicago, and St. Louis, and the Pennsylvania Co.'s railroads; 42 miles s.e. of Toledo. It is the seat of Heidelberg university (Ref.), and has an Ursuline academy, hospital, St. Francis's orphans' home, public library, electric lights, electric street railroads, national and state banks, about 16 churches, and several daily, weekly, and monthly periodicals. The principal manufactures are pottery, glass, agricultural implements, emery wheels, bent wood, lanterns, wire nails, machinery, and foundry products. Pop. '90, 10,801.

TIFFIN, EDWARD, 1766-1829; b. England; came to this country and settled in Charlestown, Va., 1786. He was both physician and Methodist preacher. He removed to Ohio in 1798, and was the first governor of that state, 1803-7; was then appointed to serve an unexpired term in the U. S. senate, 1807-9; was commissioner of the land office, 1812-15, and afterward surveyor-general of the north-western territory. The city of Tiffin was named in his honor.

TIFLIS, a government of the Russian lieutenancy of Caucasia, lying immediately south of the Caucasus. Area, 17,300 sq. m.; pop. '94, 1,090,000, chiefly Georgians, Armenians, and Tartars. It is traversed by several chains of Mountains, which belong either to the Caucasian mountains (the peak of Kazbeck, 17,500 ft. high), and extend over the n. and e. parts of the government, or to the Ararat, Achaltzick, and Alagiz mountains, spreading from the sources of the Kur and Arax over the s. districts. The principal lake, that of Goktcha, is about 50 m. long and nearly 20 m. in extreme breadth.

TIFLIS, an important Russian city, capital of the government of the same name and of the territory of the Caucasus (and s. of the mountain range of that name), stands on both banks of the Kur, in lat. 41° 42' n., long. 44° 48' e. The manufactures are not very important. The inhabitants are noted for their skill in metal working. Tiflis was formerly a fortress, and the capital of the district of Georgia. It carries on an active trade with Persia, principally through the Armenians, and is the great emporium of the Russian territory s. of the Caucasus. In the vicinity are naphtha springs as well as thermal springs, which are much visited. Tiflis was founded in the 4th c., and annexed to Russia in 1801. Pop. '97, 159,862.

TIGER, *Felis tigris*, one of the largest of the *felidæ*, equal perhaps to the lion in size and strength, and superior in activity. It has no trace of mane. It is more slender than the lion, its whole form more cat-like, its head smaller and rounder. All its motions are performed with the utmost grace and apparent ease. It does not climb trees, but winds its way through brushwood or jungle with great dexterity, runs very swiftly, and can leap an immense distance. It takes its prey either by running, or, more frequently, by lying in ambush and leaping upon it. Its strength is such that it is capable of carrying off an ox or buffalo. It is sometimes 15 ft. in entire length to the tip of the tail; an

instance is on record of 18 feet; the height is from 3 to 4 feet. The tigers of some regions differ considerably in size from those of others; thus the tiger of Bengal is much larger than that of Bokhara. The hair is thick, fine, and shining; in the colder countries which the tiger inhabits, it is thicker and longer than in tropical regions. The color is a bright tawny yellow, beautifully marked with dark transverse bands, passing into pure white on the under parts; the dark bands are continued as rings on the tail. The tail is long, slightly tapering, clothed with hair similar to that of the body. Individuals sometimes occur, of a pale whitish color, obscurely striped, the stripes only visible in particular lights. The tiger is found only in Asia. It abounds in Hindustan, in the Eastern Peninsula, in Java, Sumatra, and other tropical islands. It is found also in China and Japan, and in Persia. Its range, however, does not extend much to the west of a line drawn from the mouth of the Indus to the Caspian sea. It is found as far n. as the s. of Siberia, and even on the banks of the Obi. It inhabits woods, and cannot exist without free access to water. The islands of the delta of the Ganges have long been celebrated as a haunt of tigers. The tiger generally lies concealed in a thicket during the day, and seeks its prey by night. The prey is very often obtained by watching near the places to which animals resort for the purpose of drinking. Tigers prowl about villages, and enter cattle-folds; they also follow traveling-parties, and seize the yoke-oxen and buffaloes, particularly those which straggle away from the encampment at night. The ravages of tigers in some parts of the East Indies are very great; and a great number of human beings are destroyed by them. A notion prevails that a tiger which has once tasted human flesh becomes eager for it, and prefers it to all other food; and a single tiger has been known to kill and devour many people, watching near some frequented path, or prowling around a village. The truth appears to be that this is the mode of obtaining prey to which a tiger sometimes resorts, when incapable, through old age, of the active exertion necessary for capturing buffaloes or deer. The tiger brings forth three, four, or five young ones at a birth. When taken young, it is easily tamed, and often shows much affection for those who treat it with kindness. Tame tigers are not unfrequently to be seen in India. See illus., CARNIVORA, vol. III.

The tiger was less familiarly known to the ancients than the large African *felidae*. It is, however, mentioned by Aristotle, and it is frequently mentioned by the Latin poets. Pliny tells us that the first tiger seen at Rome was a tame one belonging to Augustus. Claudius exhibited four tigers at once.

The tiger frequently breeds in captivity, but not so frequently as the lion. A hybrid between the lion and tiger, the offspring of the male lion and the tigress, has been sometimes produced in menageries. It is striped like the tiger, and not maned. None of the hybrid cubs, however, have lived long.

Tiger hunting is a favorite Indian sport, not unattended with danger, but all the more exciting on that account. Europeans generally ride on elephants when engaged in it, and the tiger is shot from the back of the elephant. Natives, however, are employed to beat the wood or jungle for the tiger, and lives are not unfrequently lost; but the destruction of a single tiger is sometimes a thing of importance to a whole village or neighborhood. The East India company formerly gave a reward of ten rupees for every tiger killed. In most parts of India, tigers are now much less numerous than they once were. Many expeditions, of which the following are the chief, are adopted for their destruction in the countries infested by them. Bows with poisoned arrows are fixed in their paths, so as to be discharged on being touched. Heavy beams are also so placed as to fall upon the tiger pressing against a rope, and crush it by their weight. Traps of various kinds are set, sometimes baited with a live goat or other small animal. The Chinese use a box-trap with a looking-glass placed in it, and the tiger, attracted by his own image, disengages the fastening of the lid, and is captured. This method is very ancient, and is represented in ancient sculpture. A very curious mode, practiced in Oude, consists in scattering numbers of broad leaves smeared with a substance like bird-lime in the tiger's path, and if he sets foot on a smeared leaf, his fate may be regarded as sealed. He rubs his paw on his face, to get quit of the leaf, and the case becomes worse, the leaves are transferred to his face; fresh attempts to remove the nuisance only add more leaves, till he becomes completely blinded, and rolls on the ground for very rage; while the hunters, ambushed close by, apprized by his howlings, hasten to dispatch him.

The tiger is an emblem of power in the east. A tiger's head, gorgeously adorned with jewels, decorated the throne of Hyder Ali and Tippoo Sahib, and was among the spoils taken by the British at Seringapatam.

TIGER BEETLE, a name given to some of the species of the genus *cicindela*, of the family *cicindelide*, of the order coleoptera. This family comprises brilliant-colored beetles with large head and globose eyes, long antennæ, and very long, toothed mandibles. They inhabit warm sandy places, especially by the banks of streams, and are exceedingly carnivorous and voracious. The principal species are contained in the genus *cicindela*.

The common tiger-beetle, *c. vulgaris* of Say, is very swift in its movements, and difficult to capture. It lives in holes near the borders of water where it lies in wait for its prey. Another species is the hairy-necked tiger-beetle, *c. hirticollis* of Say. See CICINDELA.

TIGER-CAT, a name often given to some of the *felidæ* of middling size, which resemble the tiger in their form or markings. The ocelots (q.v.) and the serval (q.v.) sometimes receive this name, which, however, is not of very definite signification. The CHATI (*felis mitis*) is a tiger-cat of South America, rather more than two ft. in length, exclusive of the tail, which is about eleven inches. The color is yellowish, with irregular dark patches, those on the back forming four longitudinal rows; the markings indeed, more leopard-like than tiger-like. The chati prowls by night, and often carries away poultry from their roosting-places. Almost all tropical and subtropical countries have their tiger-cats. Several species are found in the East Indies.

TIGER-FLOWER, *Tigridia pavonia*, a plant of the natural order *iridaceæ*, the only known species of its genus, which is distinguished by the three outer segments of the perianth being larger, and by the filaments being united into a long cylinder. It is a native of Mexico, but hardy enough to endure the climate of the U. S., and much cultivated in flower-gardens for the singularity and great beauty of its flowers, which are, however, very evanescent. The root is a scaly bulb.

TIGRANES, THE GREAT, King of Armenia, B.C. 96-55; descendant of Artases, son-in-law and ally of Mithradates. He conquered Armenia Minor, Cappadocia, and Syria, the whole of n. Mesopotamia, and large possessions e. of the middle Tigris. His capital was Tigranocerta between the Tigris and lake Van. He lost all these conquests after the defeat of Mithradates. Lucullus, the Roman commander, invaded Armenia, and defeated near the capital the numerous army of Tigranes during the absence of Mithradates, and again near Artaxata. The treaty, concluded B.C. 63, left him only Armenia for which he paid to Pompey an enormous sum. His eldest son Tigranes involved him in many difficulties and bloody wars. His son Artavasdes succeeded him.

TIGRÉ, a province in Abyssinia, lat. 12° to 16° n., long. 37° 25' to 40° e.; drained by Mareb and Tacazze rivers. It is an elevated plateau varying from 3500 to 9000 ft. in height, having deep ravines, through which the rivers run; and is divided into a number of small districts. The chief towns are Antato, Axum, and Adowa, the capital, which is an entrepot for the caravan route of Massowah and Gondar. It was conquered by Theodore, king of Abyssinia, in 1855, previous to which it was an independent kingdom.

TIGRIS (Heb. *Ididdekel*; i.e., the "Dekel," equivalent to *Digla* or *Diglath*, probably a Semitic corruption of *tigra*, Medo-Persic for an arrow; hence Gr. *Tigris*, the "arrowy" stream), a large river of Asiatic Turkey, rises s. of lake Goljik, in the mountains of Kurdistan, within a few m. of the eastern bend of the Euphrates (q.v.), flows s.e. to Diarbekir, after which it makes a sharp turn, and flows due e. for 100 m. to Til. Here it receives from the north a considerable affluent, the Bitlis, and once more altering its course, runs in a south-easterly direction through desert wastes and unpeopled pastures, until it falls into the Persian gulf, after a course estimated at 1150 miles. Its chief tributaries, besides the Bitlis, are the Great and Little Zab, and the Dyala, all from the left, the waste land between it and the Euphrates (ancient Mesopotamia) not furnishing a single stream. At Kurna it joins the Euphrates, 90 m. above the mouth of that river in the Persian gulf, and henceforth the united rivers bear the name of Shat-el-Arab (see EUPHRATES). In the upper part of its course, the Tigris is a very swift stream, whence probably its name, and it brings down great quantities of mud. The principal places on its banks are Diarbekir, Mosul, and Bagdad, with the ruins of Nineveh, Seleucia, and Ctesiphon.

TILBURG, a flourishing trading and manufacturing t. in the Netherlands, province of North Brabant, is 36 m. s.e. of Rotterdam, and 14 e.s.e. of Breda. In '95, pop. 36,839, having more than doubled in 70 years. This prosperity began with king William II., when prince of Orange and commander of the army, taking up his headquarters at Tilburg, during the long contest which ended in the independence of Belgium. Much heath has been converted into arable and pasture lands, and numerous brick-works and woolen-cloth factories have arisen. The workmen's houses have each a strip of land attached, for the growth of vegetables and potatoes. Weaving woolen cloth, spinning, finishing and dyeing woolen fabrics, making soap, salt, tiles, bricks, and beer, are the principal industries. The chief buildings are the new palace, the town-house, the barracks, and the cloth-hall. Tilburg has four Roman Catholic churches, a reformed church, a synagogue, a high school with a course of five years, a drawing school, and several charitable institutions. The town is mentioned as early as 709.

TILBURY FORT, in Essex, is situated on the n. bank of the Thames, opposite to Gravesend. Originally erected in the time of Henry VIII. as a block-house, it was converted (1667) into a regular fortification after the bold expedition of De Ruyter into the Thames and Medway. It is of a rectangular form, built chiefly of brick, with a massive stone portal, and is surrounded by a deep and wide fosse, which can easily be filled with water. Batteries of heavy ordnance are placed so as to command the river and the reach below; there are also piers for the landing of troops, stores, etc. The banks of the Thames being here very flat, the ground around the fort is during floods and high tides laid under water, and the atmosphere of the place is unwholesome.

TILDEN, SAMUEL JONES, b. N. Y., 1814; graduated at Yale college; studied law in the University of the City of New York, and was admitted to the bar of the metropolis. He achieved a reputation for great legal skill, particularly in railroad litigation. Having interested himself in local and state politics, he was made chairman of the democratic state committee of New York, a position which he held for thirteen years. In 1846, and again in 1872, he was a member of the state assembly; and in 1874 was elected governor of the state by the democratic party. In June, 1876, he was nominated, by the democratic national convention at St. Louis, the candidate of the party for the presidency. At the election in November, Mr. Tilden received a majority of the popular vote, but the vote in the states of Louisiana, South Carolina, Oregon, and Florida being disputed, great popular excitement ensued, and the two political parties were forced to agree upon a compromise. A commission was appointed (see **ELECTORAL COMMISSION**), of 5 senators, 5 judges of the supreme court of the United States, and 5 representatives. This commission divided on party lines, and voted 8 republican to 7 democratic; and by their decision the disputed votes were given to Rutherford B. Hayes, the opposing candidate, who was declared elected president by a majority of one electoral vote. In 1880 Mr. Tilden was again in question for the democratic nomination for president, but declined it in a letter read before the democratic national convention at Cincinnati. After that period he lived in retirement. He d. 1886, leaving a large part of his property to found a library and reading room in New York city. In 1895 it was decided to unite this with the Astor and the Lenox libraries under the name of the New York Public Library (Astor, Lenox, and Tilden foundations).

TILES (Lat. *tegula*, from *teg-*, to cover; Fr. *tuile*), plates of baked clay, of various shapes, according to their use, some being for roofs, some for pavements. The finer kinds of paving-tiles are known as encaustic tiles (q.v.). The small cubical pieces of burnt clay, stone, glass, or other material used for mosaic pavements are called tesserae (Gr. *tessares*, four). See **MOSAIC**. Besides ornamental tiles, much improvement has been lately effected by various manufacturers in the different kinds used for roofing purposes, especially by the use of fire-clay, by which a tile is made not only greatly superior in strength and durability, but also in sharpness of form and diminution of thickness. Ridge-tiles of a very ornamental character are also largely made. Drain-tiles have been described under the head of **PIPES**.

TILE STONES, the uppermost group of the silurian period, consisting of a reddish, thin-bedded, slightly micaceous sandstone, which in some places attains a thickness of 1000 feet. The beds were originally considered as of old red sandstone age; then they were regarded as a transition group, forming a passage from the silurian strata to the old red sandstone; but it is now ascertained that the fossils agree in great part specifically, and in general character entirely, with those of the underlying upper Ludlow rocks, and they are accordingly considered to be the newest group of the upper silurian division. The tilestones are well seen at Kington in Herefordshire, and at Downton Castle, near Ludlow, where they are quarried for building purposes. From the latter locality they have received the name of the Downton sandstones.

TILGHMAN, TENCH, 1744-86; b. Easton, Md.; son of James and brother of Judge William; was a merchant in 1776; was appointed private secretary and aid-de-camp to Gen. Washington, and served in that capacity throughout the revolutionary war, with the rank of lieutenant-col. He was the bearer to congress of the news of the surrender of Cornwallis, and received a vote of thanks. His record, indorsed by Washington, is that of a brave soldier, who had been "in every action in which the army was concerned," and "a faithful assistant to him for nearly 5 years," a great part of which was gratuitous service.

TILIACEÆ, a natural order of exogenous plants, of which nearly 400 species are known, mostly trees and shrubs, with a few herbaceous plants. They are mostly natives of the tropics. A few are found in the temperate parts of the northern hemisphere. They have simple, alternate leaves, with stipules, and axillary flowers. The calyx is usually of four or five sepals; the corolla, of four or five petals. The corolla is sometimes wanting. The stamens are generally numerous, hypogynous, distinct; the outer ones sometimes abortive and petal-like. The ovary is composed of 2-10 carpels; there is one style, and the stigmas are equal in number to the carpels. As the characters somewhat correspond with those of *malvaceæ*, so do the properties of the order, which are generally mucilaginous and wholesome, the bark fibrous. Some yield a light and useful timber, as the lime (q.v.) or linden tree, a well-known European representative of the order, the halmalille (q.v.) of Ceylon, the *grewia elastica* of India, and the *tuehia divaricata* of Brazil. The bark of the lime-tree is valuable from its fibrous character; that of the species of *grewia* is used in the same way in India, and that of all the species of *apeiba* in South America. The most important fibrous plants of the order, however, are the species of *corchorus* (q.v.), which yield jute (q.v.).

TILL, a term employed, chiefly in Scotland, for the boulder clay (q.v.). See also **PLEISTOCENE**.

TILLAMOOK, a co. in n.w. Oregon, on the Pacific Ocean; about 1525 sq.m.; pop. '90, 2932, chiefly of American birth. The surface is mostly woodland. There is good pasture

land along the streams. Iron and coal are found. The principal productions are butter, wheat, oats, and live stock. Co. seat, Tillamook.

TILLANDSIA. See BROMELIACEÆ.

TILLEMONT, SEBASTIAN LE NAIN DE, the well-known ecclesiastical historian, was born at Paris, Nov. 30, 1637. His father was Jean le Nain, who held the office of *Maître des Requêtes*, the title, De Tillemont, by which the historian is commonly known, being derived from a small estate near Vincennes, which belonged to his family. He was educated at Port Royal, where he early imbibed those serious and rigorous views of the spiritual life which characterized the members of that celebrated society. His theological studies were marked from the first by a spirit of inquiry into the writings of the fathers; and he is said to have begun as a student those analyses of the works of the fathers, especially of the apostolic fathers, which form the staple of the early volumes of his history. Naturally of a timidly scrupulous disposition, he hesitated long about the choice of a profession; but after various changes of life, he at last received sub-deacon's orders in 1673, being then 35. He deferred his ordination as deacon till the end of 1673; nor was it till 1676 that he was ordained a priest, mainly at the persuasion of his friend, Le Maistre de Sacy, who had long been his spiritual adviser, and with whose attachment to the Jansenistic principles he sympathized at least to a certain extent. In 1679, Tillemont took up his residence at his family estate of Tillemont, where he resided till 1681. In that year he made a visit to Holland and the low countries, for the purpose of visiting Arnauld and the other Jansenist refugees. He was induced, in the following year, to undertake a parochial charge—that of St. Lambert; but he held it only for a short time.

During these years, he had steadily pursued the historical studies which he had commenced almost during his school-days; and he had now prepared the first portion of his long-projected work on the history of the church. He was induced, on the very eve of printing, to change the plan of the work. In order to avoid the opposition of the censor, to whom, as a theological work, it would have been necessary to submit it in its first form, and whose suspicions were aroused by the known association of Tillemont with the Jansenist party, Tillemont separated from the church history the history of the emperors, which he was enabled to print as a distinct work, without referring it to the censorship, under the title *Histoire des Empereurs* (6 vols. 4to, 1692). The success of this work disarmed the opposition of the church authorities. The hostile censor was replaced by a less exacting one; and eventually, in 1693, the first volume of the church history appeared under the title *Mémoires pour servir à l'Histoire Ecclésiastique des six Premiers Siècles* (16 vols. 4to). Neither of these works, however, was completed during the author's lifetime. Only 4 out of the 6 volumes of the *Emperors*, and 4 out of the 16 of the *Histoire Ecclésiastique*, were printed under his own care. The remaining volumes were completed by him, but did not appear till after his death. The *Emperors* comprises all the reigns from Augustus to Anastasius (518); the *Histoire Ecclésiastique* comes down to about the same period. The plan of both is very much the same, being in great part a compilation of the original writers, as far as possible in their own words, but arranged with great skill and judgment, and linked together by such explanations and such a chain of narrative (within brackets) as is necessary to render them intelligible, and to carry on the course of events in a connected recital. Both these works have maintained, even to this day, their reputation for learning and impartiality; and even in the acrimonious contest of the 17th c., there was but little impeachment of Tillemont's orthodoxy, so far as the histories are concerned. His other writings, left in manuscript, were for the most part used as materials by later compilers. Some of his letters have been appended to his *Life*, published by his friend Tronchet, canon of Laval (Cologne, 1711). Tillemont died at Paris, Jan. 10, 1698, having just entered upon his 61st year. The extent and accuracy of his erudition are still freely acknowledged, and his authorities have supplied the materials of most of the church histories compiled since his time.

TILLMAN, BENJAMIN RYAN, American politician, b. in 1847 in South Carolina, of which state he was governor from 1890 to 1894. He was then elected to the United States senate. As governor of S. C., his persevering efforts to enforce the state dispensary law, which gave to the state control over the sale of alcoholic liquors, attracted general attention. In 1896 he was conspicuous in the presidential campaign as a partisan of William J. Bryan.

TILLOTSON, JOHN, Archbishop of Canterbury, was the son of a clothier, and was born at Sowerby, in Yorkshire, in 1630. His father, Mr. Robert Tillotson, was a zealous puritan—a circumstance that is not a little curious, when we consider that the son ultimately turned out the most catholic churchman of his age. Tillotson studied at Clare Hall, Cambridge, where he took the degree of B.A. in 1650, and of M.A. in 1654. The writings of Chillingworth are said to have exercised a powerful influence on his mind during his university curriculum; but he owed not less to his friendly intercourse with Cudworth, More, Rust, Smith, Wilkins, and other eminent scholars. In 1656, he became private tutor in the house of Edmund Prideaux of Ford Abbey, Devonshire, attorney-general under the protector, but appears to have returned to London shortly before Cromwell's death. At what time Tillotson entered into orders, or who ordained him, is not known, but he was a preacher in 1661—attached apparently to the Presbyterian party in the church of England, for at the famous Savoy conference (q.v.) he was

present on the Presbyterian side; but he submitted at once to the act of uniformity (1662); and in December of that year, was offered the church of St. Mary Aldermanbury, London, of which Edmund Calamy had been deprived; but declined it. In 1663, he was appointed to the rectory of Keddington in Suffolk; but almost immediately after, was chosen preacher at Lincoln's Inn, where his mild, evangelical, but *undoctinal* morality was at first little relished. "Since Mr. Tillotson came," said the benchers, "Jesus Christ has not been preached among us." However, as the graces of his character gradually displayed themselves, his popularity increased, especially when it was found, that although not a puritan, he was nevertheless averse to atheism and popery. In 1664, he published a sermon *On the Wisdom of being Religious*; and in 1666, *The Rule of Faith*, in reply to a work by an English clergyman named Sargeant, who had gone over to the church of Rome. About the same period, he took the degree of D.D.; and in 1670, was made a prebend of Canterbury. Two years later, he was promoted to a deanery; and in 1680, published a somewhat notable sermon entitled *The Protestant Religion vindicated from the Charge of Singularity and Novelty*, in which he advanced the proposition, untenable by a Protestant, that "no man is at liberty to affront (i. e., to attack) the established religion of a nation, though it be false." This proposition he subsequently, on reflection, abandoned. Along with Burnet, he attended lord Russell during his imprisonment for complicity in the Rye-house plot; and on the accession of William III., rose high into favor. In 1689, he was appointed clerk of the closet to the king; and in April, 1691, was raised to the see of Canterbury, vacant by the deposition of Sancroft (q. v.), after vainly imploring William to spare him an honor which he foreboded would bring him no peace. Nor was he mistaken in his painful presentment. The non-juring party pursued him with unrelenting rage to the end of his life; but their animosity could not extract one murmur of complaint, or one vindictive retaliation from the meek, humane, and tolerant primate. He did not long enjoy his dignity, dying of palsy, Nov. 18, 1694, at the age of 65. A collected edition of his *Sermons* was published after his death by his chaplain, Dr. Barker; and has been frequently reprinted. They were translated into German by Mosheim; and were long highly popular on account of their clear, solid, and refined thought, their easy eloquence, and their humane and moral piety. Tillotson's life was written by Dr. T. Birch (Lond. 1752).

TILLY, JOHN TZERCLAES, Count of, one of the greatest captains of the 17th c., was born in 1559, at the château of Tilly in Brabant. A pupil of the Jesuits, his natural sternness of character inclined him to embrace their doctrinal ideas; and this bent of mind was fixed by the examples of Alba (q. v.) and Requesens, under whom he was initiated into the art of war in the Low Countries. After a term of distinguished service in Hungary against the Turks, he was appointed (1610) by duke Maximilian of Bavaria to reorganize his army, but resigned this post to take the command of the Catholic army at the outbreak of the Thirty Years' war (q. v.), and in conjunction with duke Maximilian gained (Nov. 8, 1620) the battle of Prague, which dissipated the ambitious dreams of the elector-palatine. During the course of this war, he separated, by able strategy, the armies of Mansfeld and of the markgraf of Baden, beat the latter at Wimpfen, expelled Christian of Brunswick from the Palatinate (1622), defeating him at Höchst (July 22, 1622) and at Stadtlohn (Aug. 1623); the latter conflict, which was of the most desperate character, lasting for three days. Created a count of the empire, he was next opposed to the king of Denmark, whom he conquered at Lutter (Aug. 17, 1626), and in conjunction with Wallenstein, compelled to sign the shameful treaty of Lübeck (1629). In the following year, he succeeded Wallenstein as commander-in-chief of the imperial forces, and took by storm the town of Magdeburg (May 10, 1631). The unheard-of atrocities which he allowed the Croats and Walloons of his army to perpetrate on this occasion have affixed to his otherwise high reputation a foul blot, ineffaceable by all the cosmetic arts of his numerous apologists. On May 14, he made a solemn entry into the ruined city, attended the celebration of a *Te Deum* in the cathedral, and then sent to the emperor a dispatch in which occurs this remarkable passage: "Since the capture of Troy, and the destruction of Jerusalem, a victory such as this has never been seen!" From this time, however, fortune deserted him; for his next opponent was the great Gustavus Adolphus, who completely routed him at Breitenfeld (Sept. 17, 1631); and though, in the following spring, he obtained some minor successes over the Swedish gen. Horn, the king speedily forced him to retreat behind the Lech in Bavaria, and (April 5) forced the passage of the river right in his front, after a desperate conflict in which Tilly was mortally wounded. He was removed to Ingolstadt, where he died, April 30, 1632. Tilly, the victor in 36 battles, was reckoned the best general of the time till his defeat by the Swedes; he was small in stature, and of a meager habit of body, with a stern and energetic cast of countenance. Sober and continent, a despiser of luxury and wealth, his zealous support of the Catholic party was entirely founded upon his ardent zeal for the supremacy of a religion which he regarded with more than monkish devotion.

TIL-SEED. See SESAMUM.

TILSIT, a t. of Prussia, in the province of East Prussia, on the left bank of the Memel or Niemen, 61 m. n.e. of Königsberg. Pop. '95, 28,217. It stands in a fruitful district, called the Tilsit Flat, has broad streets and a cleanly appearance. Its castle and town hall are the chief buildings. It carries on an active transit-trade with Russia,

besides considerable trade in timber, corn, butter, cheese, and Russian products, and has paper, sugar, and oil-mills. Tilsit will be ever memorable in history for the treaties which were there signed between France and Russia on July 7, and France and Prussia on July 9, 1807. By the former of these, Napoleon agreed to restore to the king of Prussia a great portion of his dominions, his Polish acquisitions being joined to Saxony (see POLAND), and his possessions west of the Elbe formed into the nucleus of the new kingdom of Westphalia; Dantzic was declared an independent city; the Prussian province of Bialystok was ceded to Russia; the dukes of Oldenburg and Mecklenburg, the czar's relatives, were reinstated by Napoleon, and in return, the Bonapartist kings of Naples and Holland were recognized by the czar, etc. By the latter, the king of Prussia recognized the kings of Holland, Naples, and Westphalia, and the Confederation of the Rhine, agreed to the cessions laid down in the Russian treaty, and to other minor alienations and concessions to Saxony, amounting in all to nearly one half of his dominions; and to the exclusion from his harbors of the commerce of Great Britain, and to the occupation of the Prussian fortresses by the French, till the payment of an enormous ransom. The weighty importance of the alterations effected by this treaty is, however, dwarfed before the startling magnitude of the *secret provisions* signed between France and Russia. By these were arranged the resignation of the empire of the east to Russia, Roumelia and Constantinople being specially excepted by Napoleon, and the acquisition of the Spanish peninsula by France; the two powers were to make common cause against Great Britain, and were to force the three courts of Stockholm, Copenhagen, and Lisbon to join them; and Napoleon agreed to increase no further the power of the duchy of Warsaw, and to do nothing which might lead to the re-establishment of the Polish monarchy. By a further agreement, not put formally into writing, the mouths of the Cattaro, the Ionian isles, Sicily, Malta, Egypt, and the papal dominions were to be taken by France; and Greece, Macedonia, Dalmatia, and the Adriatic coasts, on the partition of Turkey; while, on the other hand, Russia was to obtain the rest of Turkey, and was allowed to seize Finland. These secret articles are given on most excellent authority, and their correctness is further vouched for by the conduct of France and Russia for the next few years.

TILTON, JAMES, 1745-1822; b. Del.; educated at the Philadelphia medical school. As surgeon of a Delaware regiment he was at the battles of Long Island and White Plains; and he was hospital-surgeon, 1777-88, when he resumed practice, at Dover, Del. He was often a member of the legislature; sat in the continental congress, 1783-85; and was loan-commissioner, 1785-1801. In 1812 he became U. S. surgeon-gen. He published *Economical Observations on Military Hospitals* (1813).

TILTON, THEODORE, b. N. Y., 1835; educated at the N. Y. free academy; became connected with the N. Y. *Independent*, in 1856, and was its editor for many years. He was editor of the *Brooklyn Union*, 1871-2, when he founded the *Golden Age*, of which he was editor till 1874. In the latter year he sued Rev. H. W. Beecher, for alleged seduction of his wife, but the jury after a trial of six months disagreed. Among his works are: *The King's Ring* (1866); and *The Sexton's Tale* (1867), poems; and *Tempest Tossed*, a novel (1875). He lived in Europe after 1883. Mrs. Tilton died April 13, 1897.

TIMBER, in law. Timber on land belongs to the owner of the land. Where the land is leased the tenant may use the wood for the general purposes for which the land is hired, but may not cut it off to the damage of the land. When timber is still standing it goes with the premises, if sold. It may, however, be sold like any personal property, under an agreement to cut it and take it away. The law affords the same protection to owners of timber as of other property.

TIMBERS of a ship are the upright ribs, based on the keel, and rising to the gunwale, on which the planking is fastened. See SHIP-BUILDING.

TIMBREL (Spanish *tamburil*), a small musical instrument of the drum species, in use in ancient times, which was carried in the hand, and was apparently not unlike the modern tambourine (q.v.), with or without bells.

TIMBUCTOO, TOMBOCTO, or TIMBUKTU, a famous city of Sudan, occupies a position of the highest commercial importance on the great north-western bend of the Niger; lat. 16° 47' n., long. 3° 7' west. It stands only a few feet above the level of the Niger, and at a distance of about six m. from the principal branch of that river, is triangular in shape, is from 2½ to 3 m. in circumference, and at present without walls, though in former times it covered a much greater area, and was defended by walls. It is laid out mostly in straight, but partly in winding streets of hard sand and gravel, and having a sort of gutter in the middle. There are three chief squares. The houses are of clay—some low and unseemly, and others rising to two stories, and exhibiting considerable architectural adornment—and there are huts of matting, almost all in good repair. In the n. of the city is the mosque of Sankoré, an edifice of great grandeur, and which imparts an imposing character to the whole district in which it stands; and the other chief buildings are the "Great Mosque," an immense edifice of stately appearance, 286 ft. in length, by 212 ft. in width; and a few other mosques. The climate is not considered very healthy. Timbuctoo is not a manufacturing town, almost the whole life of the city being based upon foreign commerce, for which its situation renders it the

most favored center. Of the commerce, gold, which arrives at this place chiefly in the form of rings, is the staple. Salt, and the kola-nut, which is used in place of coffee (see *TEA*), are also largely imported and re-exported, as are also tobacco and dates. English manufactures, consisting of red cloth, sashes, looking-glasses, cutlery, and calico, arrive from the n. and north-west. It is a great center of Mohammedan learning, and contains a large library. It was founded about the year 1100 by the Tuaregs, and when it fell into the power of the ruler of the Mohammedan kingdom of Melli, in the 14th century, it became a great trading place. Toward the close of the 16th century it was conquered by the Moroccans, but in 1780, when the Tuareg kingdom of Haussa was founded on the northern bank of the Niger, T. became a part of the new empire. Later it was ruled over by both Fulba and Tuaregs, but in 1863 the former were driven out by the Sheik Ahmed el Bakhaï. In 1893, the French, after gaining possession of Segou and Massina, captured T. and incorporated it in their possessions. See Barth, *Travels in Central Africa* (1857), and Lenz, *Timbuctoo* (2nd ed. 1892). The regular pop. of Timbuctoo is estimated at 20,000.

TIME, in music, is used in three different senses: 1. The relative duration of musical sounds as measured by the rhythmical proportion of the different notes, a minim being half of a semibreve; a crotchet, half of a minim; a quaver, half of a crotchet, etc. 2. The division into measures or bars, and the division of each measure into equal parts, and subdivision of these parts; the different combinations of sounds into equal measures and values being said to form different kinds of time, each indicated by a distinct rhythmical signature. 3. The degree of movement—that is, the absolute, and not relative velocity, which is now more generally expressed by the Italian word *tempo*. For time in the first two senses, see RHYTHM; in the third sense, TEMPO.

TIME, RECKONING OF. See INTERNATIONAL DATE LINE.

TIME SIGNALS, established in many important cities of England and the United States for the purpose of transmitting standard time by the telegraph. The first use of the system was in 1852, by Mr. C. V. Walker, the English royal astronomer. There are now in the United States, observatories which perform this service, in Washington, Allegheny, Albany, Cincinnati; Chicago, Cambridge, and New Haven. The method now employed is known as the Jones system. In it the clock which furnishes the standard is placed in the same electrical current with those to be controlled. In the clock to be regulated is a helix, which alternately encircles two magnets attached to the pendulum, which are alternately attracted and repelled by the helix. In New York and Boston the time of exact noon is indicated by dropping a ball from the flag poles of conspicuous buildings by means of the electric current.

TIME, STANDARD. The confusion arising from the existence of so many different time standards had become so great, that in 1869, the question of having some standard time began to be agitated. Prof. Chas. F. Dowd was the first to take active measures to bring the question before railroad officials. In this country there were about 75 different standards in use on the railways, the difference between the Atlantic and Pacific coast being about four hours. The adoption of a single standard for the whole country was impossible, as in some places there would be a difference of at least two hours between the standard and local time. Four meridians, each one hour apart, were chosen as standard meridians. They are the 75th, which passes near Philadelphia; the 90th, passing near New Orleans and St. Louis; the 105th, passing near Denver, and the 120th, near Virginia city. By the adoption of the standard meridians, one hour apart, the minutes and seconds for all the different standards will be the same, so that a clock keeping the time of the 75th meridian will differ one hour from one keeping the time of the 90th, the minutes and seconds being relatively the same. Theoretically it was intended that each meridian should govern the belt $7\frac{1}{2}^{\circ}$ on each side of it; but there has been a slight variation from this. The local time of those places at the edge of the belt will differ from the standard by half an hour. The details of the system were worked up by W. F. Allen, sec. of the Railway Time Convention. In 1883, Nov., 90 per cent. of the railroads adopted the standard time, and not more than 5,000,000 people in the whole country were using local time. The time of the 75th meridian is called Eastern time, and that of the 90th, Central, the 105th, Mountain, and the 120th, Pacific time. The adoption of the standard made New York's time four minutes slower than previously. At the conference of the International Geodetic Assoc., held at Rome, 1883, the question of cosmopolitan time was discussed. The plan of establishing 24 meridians one hour apart has been suggested.

TIMOCLES, a comic poet of Athens, who flourished about 350–320 B.C. His works have not been preserved, but he was commended in antiquity for the purity and vigor of his style. His date classes him with the writers of the Middle Comedy.

TIMOCREON, a Greek poet, a native of Rhodes, and a contemporary of Themistocles, whom he attacked in his writings. His poetry was lyrical and remarkable for its combative and bitter tone. The dates of his birth and death are uncertain.

TIMO'LEON, a great Greek general, and the liberator of Sicily from the dominion of "tyrants," belonged to one of the noblest families of Corinth, and was born there about 394 B. C. Timoleon's brother, Timophanes, having made himself tyrant of his native city, Timoleon either killed him with his own hand, or caused him to be killed. Opinion

was divided in Corinth as to the merit of this deed, one party extolling it as an act of the noblest patriotism, while the other demanded Timoleon's death as a murderer. The difficulty was got over by appointing him leader of a small band of mercenaries sent (344 B.C.) to Syracuse, the exiled citizens of which had begged assistance from Corinth, the mother-city, against the "tyrant" Dionysius and the Carthaginians. Outwitting the Carthaginians, Timoleon arrived safely at Tauromenium, where he was welcomed by the Syracusan exiles. Hicetas, "tyrant" of Leontini, was then striving to dispossess Dionysius, and secure the tyranny of Syracuse for himself, and had succeeded in getting possession of the whole city except the island citadel. Timoleon, with only a fifth of the number defeated him at Adranum; and marching to Syracuse made himself master of two quarters of the city. From this time onward Timoleon's career in Sicily was one of complete victory over all opponents. Dionysius the younger (q.v.), in 343 B.C. surrendered in despair the citadel of Syracuse, and was sent to Corinth. Hicetas having failed in the attempt to assassinate Timoleon, called in the assistance of a Carthaginian force of 50,000 men, which, however, was shortly after withdrawn by Mago, who had become suspicious of treachery. Hicetas at last fled to Leontini, leaving Timoleon sole master of Syracuse. After repeopling the almost desolate city by recalling exiles, and inviting new colonists from Greece, Italy, and Sicily, he spent the next two years in enacting laws and organizing a constitution, which he put on a completely democratic footing. The Carthaginians, alarmed at the reviving power of Syracuse, and the prospect of union among the Sicilian Greeks, now sent an army of 80,000, under Hasdrubal and Hamilcar, to subdue the whole island. Timoleon, with only 12,000, encountered them (339 B.C.) on the Crimissus, and gained one of the greatest victories ever won by Greeks over barbarians. He now proceeded with his great project of expelling the tyrants of the other Greek cities, who, however, again called in the aid of the Carthaginians; but the successes of Timoleon soon made the Carthaginians glad to conclude a treaty, fixing the river Halycus as the boundary between their dominions and those of the Greeks. Hicetas, tyrant of Leontini, being now captured, was put to death with his wife and daughters; and shortly after Mamercus of Catana suffered the same fate. Timoleon thus in about six years freed Sicily from nearly all its tyrants, and conferred upon the cities free constitutions, himself all the time taking no advantage of the immense influence which he thus obtained. After his great work was accomplished he lived among the Syracusans as a private citizen, receiving from them and from all the Greek world the greatest honor and respect: his advice was had recourse to by all the Sicilian cities in any emergency. He died in 337 or 335 B.C., having been blind for a considerable time previously, and was buried in the market-place of Syracuse, where a gymnasium, called the Timoleonteum, was afterward erected over his tomb. Timoleon was undoubtedly one of the greatest generals and noblest characters produced by Greece; he appears to have been thoroughly unselfish, and to have set before him as his great aim the abolition of tyranny, and the establishment of freedom.

TIMON THE MISANTHROPE was a native of Athens, and lived in the time of the Peloponnesian war (431-404 B.C.). The little that is known concerning him is learned chiefly from Aristophanes and the other comic writers who attacked him. Disgusted with mankind, on account of the ingratitude of his early friends and companions, he lived a life of almost total seclusion from society, his only visitor being the "bold and insolent" Alcibiades. Numerous stories were current in antiquity regarding his eccentricities, one of which is, that he died because he would not allow a surgeon to visit him to set a limb. His grave, which was on the sea-shore, is said to have been planted with thorns, and to have been rendered inaccessible by the sea forming it into a small island.

We know him out of Shakespeare's art,
And those fine curses which he spoke—
The old Timon with his noble heart,
That strongly loathing, greatly broke.

—TENNYSON.

"The Timon of Plutarch and of the popular stories of Shakespeare's time was little different from the ordinary cynic. The Timon of Shakespeare is essentially high-minded and generous, his all-absorbing defect—the root of those generous vices which wear the garb of virtue—being the entire want of discrimination. If Timon had possessed one friend with whom he could have exchanged confidence upon equal terms, he would have been saved from his fall, and certainly from his misanthropy."—See Introductory Remarks to *Timon*, in Knight's Shakespeare.

This Timon must be distinguished from the Greek poet and philosopher of the same name, who lived about a century and a half later.

TIMOR, the most important of the chain of islands which stretch eastward from Java, lies in 8° 30' to 10° 20' s. lat. and 124° to 127° 30' e. long., has an area of 12,000 sq. m., and pop. of 500,000-600,000. A chain of wood-clad mountains runs throughout its entire length; Alas, on the s.e., being 11,500 ft. in height; Lakaan, in 9° 10' s. lat., 6,175 ft.; and Miomaffo, 4,630. The prevailing rocks are of the graywacke formation, which, at the s. base of Miomaffo, is cut by serpentine mountains of limestone; and calcareous rocks resembling ruins frequently occur. Magnetic iron, porphyry, syenite, gold, copper, malachite (containing 22 per cent. of pure copper), sulphur, and naphtha are found.

The dry monsoon is from May to November, during which no rain falls. From November to April there are daily storms of rain and wind from the n.w.; the streams are swollen; the thermometer rises to 94° F. in the shade; the earth is covered with a dark-green carpet, and myriads of insects come into life. The rivers are numerous, but small, and most of them yield gold. Near the sea are very fertile lands, on which are grown rice, maize, beans, tobacco, sugar-cane, cotton, potatoes, and all sorts of tropical fruits. There are many varieties of the palm, the lontar being useful for food and other purposes. Timber trees suited for masts attain a height of 100 ft., and from 3 to 4 in diameter; the wild nutmeg, cinnamon, and tamarind are plentiful; and bamboos make the forests impenetrable in many parts. About 600 species of plants are known, a great number being medicinal, and few poisonous. Indigo grows everywhere, and potatoes in the mountains.

Three-fourths of Timor on the s.w. is subject to the Dutch, whose chief settlement is Koepang (Kūpang); the remaining part in the n.e. belongs to the Portuguese, who have a town called Dilley, on the n. coast, with a safe roadstead, and a fort, which was nearly destroyed by an earthquake in 1857. Timor is divided into small kingdoms, ruled by rajahs under Dutch or Portuguese control.

Koepang lies at the base of a semicircle of wooded hills, on a beautiful bay in the south-west. It is irregularly built, the principal buildings being the governor's house and the Protestant church. There is a Mohammedan and a Chinese temple, one Dutch and two Malay schools. Whalers and trading-ships from Sydney, Van Diemen's Land, etc., call for provisions on their way to or from Java and Singapore; and Timor will be a convenient market for horses and supplies to the settlements in North Australia, which is only eight days' sailing distant.

The exports are—sandal-wood, horses, wax, tortoise-shell, edible nests, etc.; imports—cotton, woolen, and silk fabrics, provisions, and general supplies. Pearls are found on a bank 30 m. s.e. from Koepang. The natives are partly Oceanian negroes, and partly of Malay race. They worship a supreme being called "Lord of the sun." Near the Netherlands' settlements, some hundreds have been baptized, but missionary efforts have not been very successful. The fathers dispose of their daughters for gold and buffaloes, and polygamy prevails among the rich.

Koepang is the capital of the Netherlands' residency or government of Timor, which includes Samao, Rotti, Savu, the Sandal-wood island, Sumbawa, Flores, Adanara, Solor, Lomblem, Ombay, and all the small islands belonging to the chain.

TIMOR-LAUT, THE, or **TENIMBER ISLANDS**, lie e. from Timor, in 7° 10'–8° 30' s. lat., and 131°–131° 40' e. long., having an area of 2120 sq. m. Pop. 20,000. By far the largest island of the group is Timor-Laut, which is 78 m. in length, and 21 in breadth. The soil is rich, and covered with the most luxuriant vegetation, various palms and other useful trees growing in great abundance. At a little distance from the shore, mountains encircle the island.

The next in importance is Larat, the n.w. point of which is in 7° 6' s. lat., and 131° 47' e. long. Area, 147 sq. m. It is also mountainous. Further n. are Vorhate, Marū, and Molo. On the w. of Timor-Laut are Selū and Sejah; a multitude of smaller islands of coral formation being scattered around.

On the larger islands are small horned cattle, goats, swine, fowls, and a great variety of birds. Nothing can exceed the beauty of the blue-streaked lory (*eos reticulata*) and citron crested cockatoo (*cacatua citrino-cristatus*). Fish are plentiful in the rivers of the Timor-Laut and surrounding seas, and there is a considerable export trade in tortoise-shell and béche-de-mer (q. v.). English trading-ships from Singapore, and south-sea whalers, sometimes visit these islands, and not unfrequently have been treacherously attacked. The natives are tall, well made, fairer complexioned, and have more regular features than the Alfours. They are low in the scale of civilization.

TIMOTHY, a Christian disciple of Greek and Jewish parentage, well instructed in the Scriptures, and becoming, at Derbe, Paul's companion and helper in his missionary work. The apostle esteemed him "as a son with his father." In many of the epistles Timothy's name is joined in salutation with Paul's; he shared even imprisonment with the apostle, and was anxiously looked for by him when, having finished his course, he was ready to be offered. He is commonly spoken of in ecclesiastical history as the bishop of Ephesus; in the New Testament he appears as an apostolic vicar in the church in that city.

TIMOTHY, FIRST AND SECOND EPISTLES TO, form, along with the epistle to Titus (q. v.), the three "pastoral epistles," the authorship of which is all but universally ascribed to St Paul. The external evidence for their genuineness is very strong, yet not complete. They occur in the Muratorian canon and the Peshito version as writings of St. Paul; Eusebius classes them among the *homologoumena*; while still earlier, Irenæus, Tertullian, and others of the fathers quote them as authoritative. On the other hand, Tatian (q. v.), one of the earliest of the fathers, denies their genuineness, as did also Marcion, Basilides, and most of the Gnostic teachers. Origen speaks of some who rejected 2d Timothy on account of the mention of "Jannes and Jambres," two apocryphal characters; while in modern times, Schleiermacher and Neander admit the Pauline origin of 2d Timothy, and

endeavor to disprove the genuineness of the 1st. Eichhorn, De Wette, Baur, and others go further, and seek to demonstrate the spuriousness of the whole three pastoral epistles. They consider the language and mode of thought quite distinct from the Pauline, and they (particularly Eichhorn) find no period in the apostle's life to which they could be properly fitted in. Their arguments have largely influenced the conclusions of very many scholars in this field. The purpose and scope of the epistles to Timothy are so well known, that an analysis, however slight, is almost superfluous. They consist of a series of warnings, exhortations, advices, and predictions.—See the "Introductions" of Alford, Wordsworth, Davidson, Wiesinger, Hug; and the list of commentators on the "Pastoral Epistles," appended to the article on the epistle to Titus. The general design of the First Epistle to Timothy is to instruct Timothy in the duties intrusted to him, and to guide the churches through him. Besides the introduction and conclusion it consists of three parts: The 1st sets forth Timothy's general duties, and gives him a special charge concerning false teachers who sought to bring Christian believers again under the yoke of the law. The 2d contains instructions concerning divine worship, the qualifications to be required in ministers and deacons, and the conduct to be exhibited by Timothy himself. The 3d condemns vices which were common at Ephesus. The design of the Second epistle is chiefly to utter a final warning against the errors and delusions which were making progress in the churches. It exhorts Timothy to maintain zealously sound doctrine, to be patient under trials, careful concerning his own conduct, and diligent in his endeavor to resist the efforts of false teachers. It closes with announcing the apostle's belief that his martyrdom was near and urging Timothy to come quickly to him.

TIMOTHY GRASS, the name commonly given to *phleum pratense*, a grass much valued for feeding cattle. It first received the name timothy grass in America, from the name of a person who did much to promote its cultivation there. Along with the other species of the genus, it often receives also the English name of CAT'S-TAIL GRASS. The genus *phleum* is distinguished by a panicle so compact as to resemble a close spike, single-flowered spikelets, with two nearly equal acuminate or almost awned glumes, two awnless paleæ, and the seed free. The species are mostly natives of Europe; a number of them are British, but the timothy grass alone is of any economical value. It varies very much in size according to soil and situation, succeeding best in moist rich soils. It is very extensively cultivated both in Britain and in America. It has strong culms, attaining a height of 4 to 5 ft., but is tender and nutritious, and much relished by cattle. It is perennial, but springs up rapidly, even in the year in which it is sown. Its spike-like panicle, from the form of which the name cat's tail has been given, is cylindrical, and often of several inches in length. The seed is very small.—*Phleum nodosum* is a very similar species, perhaps a mere variety, with the lower part of the culm prostrate and swollen into knots or bulbs; the spike much smaller than in *P. pratense*. It is a very inferior grass, and is found only on dry soils.

TIMBOD, HENRY, 1829-67; b. Charleston, S. C.; educated at the Georgia university. He practiced law and was a teacher for several years, during which he contributed verse to southern papers and magazines. He was editor of the *South Carolinian* (Columbia) from Jan., 1864, to the time of the burning of the city in the civil war. Two editions of his collected poems have been published; the last, 1873, accompanied by a *Memoir* written by Paul H. Hayne.

TIMUQUANS, an extinct tribe of Indians, a part of the Choctaw family, which inhabited the coast of Florida, near St. Augustine. Missionaries were sent to them by the Franciscans as early as 1592, and continued their labors among them until Carolina and Georgia made war upon the tribe, almost annihilating them, the few who survived joining other tribes. A catechism, grammar, and church manual, in their language, was printed in Mexico about 1612, written by father Francisco Parejo. They were generally a peaceful tribe, and became somewhat civilized.

TIMUR, called also TIMUR-BEG and TIMUR-LENG, from his lameness, and vulgarly known among western writers as TAMERLANE, was the second of the great conquerors whom Central Asia sent forth in the middle ages, and was b. at Sebz, 40 m. from Samarkand, April 8, 1336. His biographers make him the fifth in descent from Karatchâr Nuyan, the relative and counselor of Genghis Khan (q.v.), and the ninth from Tûmna Khan, the direct ancestor in the male line of his renowned predecessor. The royal line of Jagatai (see TURKISTAN) had so utterly degenerated that the real power was in the hands of a number of independent chiefs of Mongol blood, each of whom, choosing a prominent city of the kingdom, there set up his standard and lorded it over the surrounding district. One of these chiefs, Hadji Berlas, the uncle of Timur, had established himself at Kesh, and here the future conqueror passed the first 24 years of his life in peaceful obscurity, devoting himself to the national amusements of hunting and equestrianism. But a formidable inroad (1360) of the Kalmucks of Jettah, who speedily subjugated Turkistan, expelling those chiefs who refused submission, effectually called forth Timur's hitherto untried energies. Declining to accompany his uncle in his flight, he boldly advanced with a small retinue to meet the invader, who was so charmed with his eloquence and address that he at once confirmed him in the government of Kesh, and

appointed him one of the principal ministers of his son, the new monarch of Turkistan. But neither chiefs nor people of the conquered country could long endure the tyranny of a race more cruel and barbarous than themselves, and the exiles and fugitives having been collected by the Ameir Husseyne, and joined by a powerful force under Timur, the Kalmucks were ultimately expelled in 1365, and Turkistan divided between its two liberators, who ruled together in the utmost harmony for some time; but war having arisen between them, Husseyne was defeated and slain, and Timur, by unanimous consent of the chiefs, was hailed as supreme lord of Turkistan. It was in the war with the Kalmucks that Timur received the wound in the thigh which rendered him lame for the rest of his life. He did not, however, either then or afterward, assume the rank of a sovereign, but elevating one of the royal race to the throne, reserved for himself the real authority and the title of *emir*. Having thus, in the space of ten years, risen, by dint of superior ability, to absolute authority over a numerous and warlike people, he proceeded to avenge his nation's wrongs on the Kalmucks of Jettah and Mogulistan; then turned westward to punish the predatory tribes of Khaurezm, who had plundered Bokhara; and spent the interval between these campaigns in supporting Toktemesh Khan, one of the claimants to the throne of Keptchak, ultimately (1376) placing him in undisputed possession. With the view of restoring its former limits to the empire of Jagatai, he summoned the prince of Herat and the other chiefs of Northern Khorassan to attend a "kouriltai;" and on their refusal, immediately attacked and reduced them to submission, levying a moderate contribution as a penalty. But soon after (1383) the people of Herat again rebelled, murdered the envoys whom he sent to remonstrate; and 2,000 of the garrison, built up with an alternate layer of brick and mortar into the form of a pyramid, were left by Timur as a horribly singular and effective reminder of the consequences of rebellion. Seistan was next reduced, the Afghans of Suliman Koh chastized, and Timur returned, as was his wont, to spend the winter in the bosom of his family, at one or other of his numerous palaces near Samarkand. In the following year he commenced his career of aggression by the invasion of Mazanderan; and by the close of 1387 the whole of the districts west of the Tigris, from Tiflis to Shiraz, were subdued; those chiefs who voluntarily submitted being mostly confirmed in their governments, while the inhabitants of Ispahan—who, after a pretended submission, suddenly rose upon the Tartar garrison and massacred 3,000 of them—were almost completely exterminated. Meanwhile, Toktemesh Khan, of Keptchak, took advantage of his absence to invade Timur's territories on the Amu-Daria; on which Timur returned home, and, after driving the invaders out, pursued them to the head of the Tobol, then west across the Ural mountains and river, and though long baffled by the Arab tactics of his opponents, finally brought them to bay on the banks of the Bielaya (a tributary of the Kama), June 18, 1391, and almost wholly annihilated them. Resuming in 1392 his conquering march westward, he crossed the Tigris, subdued the numerous and warlike principalities to the east of the Euphrates, then advanced northward, through the gates of Derbend, to the Volga, and again routed Toktemesh (who had ventured to resume hostilities) on the banks of the Terek (1395), turned west as far as the Dnieper, and then north to Moscow, returning by Astrakhan and the Caucasus, leaving death and desolation in his track. In 1398 Timur campaigned in Hindustan, entering by the passes of the Hindu Koh, near Cabul, and routing *seriatim* the numerous armies collected to oppose him, till the number of prisoners became so great, that four days before the great battle before Delhi between Timur and the Indian emperor, the former, as a precautionary measure, ordered the murder, in cold blood, of all the males (said to be 100,000 in number), and then, after totally routing his opponents, took the capital. After a further advance to the Ganges, and more military successes, Timur retraced his steps to Samarkand, where the immense spoils of the expedition were expended in the adornment of the capital. Timur returned to Western Asia in the following year, and attacked the Egyptian empire in Syria, to avenge the murder of his ambassador, and the aid which the Mamaluke sultan had given to his enemies. Timur was as usual completely successful in the field; and the capture of Aleppo, Hama, Hems, Baalbek, and Damascus, equally proved his skill in the attack of fortified places. His mode of attack was to undermine the fortifications on all sides, then to fire the mines with wood steeped in naphtha, and on the destruction of the walls and battlements, which uniformly resulted, to charge in overwhelming force through the breaches. Similar conduct to that of the Mamluk sultan on the part of sultan Bajazet I., drew from Timur repeated remonstrances, which the other, in the overweening confidence springing from uninterrupted success, treated with contempt and answered with insult; but the advance of the Tartars to his frontiers soon opened his eyes to the greatness of his error, and with a powerful army he hastened to oppose them. The two hosts met at Angora (July 20, 1402), and after a long and obstinate contest, in which, although the generalship of Bajazet and the steadiness of 20,000 Servian auxiliaries long balanced the superiority of Timur's troops, the Turks were totally routed, and Bajazet captured. The conquest of the whole of Asia Minor speedily followed; the Byzantine emperor did submission to the victor, as did also the Turkish ruler of Thrace; and the knights of St. John were expelled from Smyrna. The unfortunate Bajazet died after a few months' captivity, though uniformly treated with the greatest consideration; and about the same time Timur commenced his return—receiving on the way a most satisfactory embassy from the Egyptian sultan,

who was now glad to come to terms—conquering Georgia, where he passed the winter, and resuming his march in the following year by Merv and Balkh, reached Samarkand in 1404. Here he resumed preparations for the long projected invasion of China, continued the embellishment of the capital, and celebrated his great successes by the most gorgeous festivities. All things being now ready, he started with a large army for the Sihun, marched down that river to Otrar, where, being detained by the severity of the weather, he was attacked by an ague-fever, and died after a week's illness, *R. b.* 17, 1405. Timur holds a high position as a mere conqueror: his antagonists were mostly warlike and disciplined, and seldom much inferior in number; yet, from the savage horsemen of the Siberian steppes to the mail-clad warriors of Servia, all were alike forced to bow before the invincible prowess of the Mongol conqueror. The charge of cruelty brought against him is completely established by the massacre in India, but opposite to this might be placed numerous instances of a lenity and forgiveness almost incredible in a "barbarian." He did much to promote the arts and sciences throughout his dominions, but the speedy dissolution of his empire deprived his labors of any permanent utility. The principal authority for the life of Timur is Sherif-ed-Din-Ali's *History* (in Persian), translated into French by Pétis de la Croix, under the title of *Histoire de Timur-Bec, connu sur le nom du grand Tamerlan* (4 vols., Par. 1723). Several writings exist in Persian, attributed to Timur, but are of doubtful authenticity. Among these are the *Institutions* (with an English translation and a valuable index, Oxford, 1783); and the *Commentaries* of Timur, translated from a MS. of Maj. Davy by Maj. Stewart, late professor of oriental languages in the East India company's college. See also a translation of the narrative of Clavijo, envoy of Henry III. of Castile to Timur, by C. R. Markham (Hakluyt society, 1860).

TIN (symb. Sn, atomic weight 118,* spec. grav. 7.29) is a beautiful silvery-white metal, with a tinge of yellow, and a high metallic luster. It possesses a crystallized texture, and may be obtained in well-formed crystals of the pyramidal or tetragonal system; and it is in consequence of this crystalline texture that a bar of tin, when bent, emits a creaking sound, termed the *cry* of tin (the *Zinngeschrei*, or tin-shriek of the Germans). Tin is a soft metal—being softer than gold—and is very malleable, and can be beaten out into very thin laminæ, in which form it is known as tin-foil. At a temperature of about 212° F. (100° C.) its ductility is considerable, but by no means remarkable, and it may then be easily drawn into wire, the tenacity of which is only moderate, as a wire with a diameter of 0.17 of an inch is broken by a weight of about 50 pounds. It is a tolerably good conductor both of heat and electricity, and when handled communicates a peculiar odor to the skin. It melts at a temperature of 455° F. (235° C.); and at a higher temperature, if air be present, it becomes converted into the binoxide, and burns with a brilliant white light. At ordinary temperatures it is very slightly acted on by exposure to the air or to moisture. With regard to the action of the ordinary acids on this metal, Prof. Miller observes that "nitric acid of specific gravity 1.3 acts upon it violently, and produces an insoluble hydrated binoxide, known as metastannic acid; at the same time, owing to the decomposition of water, a considerable quantity of ammonia is formed, which enters into combination with the excess of acid. Strong hydrochloric acid, when heated upon tin, dissolves it gradually, with evolution of hydrogen. Aqua regia, if not too concentrated, dissolves the metal, and converts it into tetrachloride. Dilute sulphuric acid is without action on the metal in the cold; but if the concentrated acid be boiled upon it, the tin becomes converted into sulphate, while sulphurous acid escapes. The hydrates of potash and soda act upon tin at high temperatures, hydrogen being evolved, while a soluble metastannate of the alkali is formed."—*Inorganic Chemistry*, 2d ed., p. 588.

There are two oxides of tin—viz., the protoxide, SnO, and the binoxide, SnO₂.

Protoxide of Tin, or stannous oxide, SnO, is obtained as a white hydrate, 2SnO.H₂O, by precipitating a solution of the protochloride of tin with an excess of carbonate of soda. The protoxide acts as a base, forming salts which are colorless, redden litmus, and are for the most part soluble in water, from which crystalline tin is deposited on an inserted mass of zinc, constituting the so-called *tin tree*. None of these salts are of any special importance. *Binoxide of tin*, or stannic oxide, SnO₂, occurs native as cassiterite or tinstone, crystallizing in square prisms, which are sufficiently hard to scratch glass, and generally of a brown color, from the presence of peroxide of iron or of manganese. In its artificially-prepared hydrated condition, it has the character of an acid, and according to its different modes of preparation, forms two remarkable varieties, known as stannic and metastannic acids. *Metastannic acid* is prepared by the action of strong nitric acid on tin, and occurs as a white, crystalline, insoluble mass, which, when dried in air, consists of H₁₀Sn₆O₁₅.5H₂O, but when dried at 212° F. (100° C.), loses five molecules of water, and consists of H₁₀Sn₆O₁₅. By ignition, it becomes anhydrous, and of a pale straw color. In this form (in which it resembles the native binoxide in its properties), it is known in commerce as *putty-powder*, and is employed for polishing plate, and for giving whiteness and opacity to enamels. In the hydrated state, it is insoluble in hydro-

* The atomic weights (and corresponding notation) adopted in this article are those of the unitary system (H=1, O=16, S=32, C=12) instead of the older dualistic system (O=8, S=16, C=6). See art. CHEMISTRY.

chloric or nitric acids, but is freely soluble in solution of potash or soda, forming salts which are not crystalline, but may be obtained in a granular form. Metastannic acid, in its hydrate state, may be recognized by the beautiful golden yellow metastannate of tin, which is formed when it is moistened with protochloride of tin. *Stannic acid*, $\text{SnO}_2 \cdot 2\text{H}_2\text{O}$, is procured by the addition of carbonate of lime or of baryta to a solution of tetrachloride of tin, when it falls as a gelatinous precipitate. Unlike metastannic acid, it is readily soluble in nitric and hydrochloric acids; and at a temperature of 284°F . (140°C .) it is converted into metastannic acid. In combination with the alkalies, it forms stannates, which crystallize readily, and whose formula is MO_2SnO_2 . The stannate of soda, Na_2SnO_3 , is largely used as a mordant by the dyer.

There are two chlorides of tin—viz., a protochloride and a tetrachloride. The *protochloride of tin*, or stannous chloride, SnCl_2 , may be obtained in a hydrated form by dissolving the metal in hydrochloric acid, and evaporating the solution, when the salt crystallizes in prismatic needles, having the composition $\text{SnCl}_2 \cdot 2\text{H}_2\text{O}$. The hydrated protochloride is extensively used as a mordant, and for deoxidizing indigo and the peroxides of iron and manganese, by the dyer and calico-printer; and in consequence of its deoxidizing or reducing powers, it is sometimes employed in analytical chemistry, especially in the determination of the quantity of mercury, since all the mercurial salts, when boiled with it, are decomposed, and yield their mercury in the metallic form. *Tetrachloride of tin*, or stannic chloride, SnCl_4 , forms numerous double salts with the soluble chlorides; the compound of this nature which it forms with chloride of ammonium is represented by the formula $2\text{NH}_4\text{Cl} \cdot \text{SnCl}_4$, and is employed by the dyer under the technical term of *pink salt*. An impure tetrachloride, prepared by dissolving tin at a gentle heat in a mixture of nitric acid and sal-ammoniac, and known in the trade as *nitromuriate of tin*, or *composition*, is also largely used by dyers and calico-printers.

The sulphides of tin are three in number—viz., the protosulphide, the sesquisulphide, and the bisulphide. The *bisulphide of tin* SnS_2 , may be obtained in the hydrated state, in the form of a dingy yellow precipitate, by passing sulphureted hydrogen through a solution of a persalt of tin. In the dry way, it is procured in the form known as *Mosaic gold*, which is insoluble in any acid, though soluble in aqua regia; and is employed in the arts to give an appearance of bronze to the surface of metals.

Tin forms two sets of salts—the protosalts and the persalts, of which the protochloride and tetrachloride of tin may be taken as good examples. The *protosalts* (stannous salts) yield a very characteristic reaction with sulphureted hydrogen, a chocolate-colored precipitate of hydrated protosulphide of tin being thrown down; moreover, with a dilute solution of chloride of gold, they give either a beautiful purple precipitate, known as the *purple of Cassius*, or a brown precipitate of reduced gold, according to the quantity of the test that is used. The *persalts* (stannic salts) yield a dirty yellow precipitate of hydrated bisulphide of tin; while all the compounds of tin, when exposed on charcoal to the reducing flame of the blowpipe, give a white malleable globule of the metal.

Reduction and Manufacture.—Tin must have been one of the metals earliest known, as it enters into the composition of bronze (q.v.), of which the most ancient metallic weapons and tools were made. Tin and oysters were the products for which Great Britain was earliest famous. This general statement of facts is particularly noticeable. Tin is still largely obtained in Cornwall; and from that locality the Phœnician navigators took it to Tyre and Sidon. To this day England is one of the greatest tin-producing countries, having produced in 1894 18,461 metric tons of tin, and in 1895, 6755 metric tons. Bohemia and Saxony have some tin mines, and so also have Spain and Portugal. Tin has long been obtained from Malacca, in the Malayan peninsula, and from some of the neighboring islands. Australia, among her other mineral riches, produces tin, and it is found in the Black Hills of Dakota.

There was no tin produced in the United States in 1896, and there was very little done in prospecting for the metal. There was a little systematic work done in that direction in South Dakota, while the California mines and those of Virginia remained idle. New discoveries of tin ore were reported in 1896 in Lemhi Co., Idaho, and Garfield Co., Utah, but they are presumably of little consequence. In the tin producing countries 1896 was generally an unfortunate year. Malacca, Banca, and Billiton made a slight increase in production. Bolivia which has been coming to the front rapidly in recent years fell off a little, while in Australia, Tasmania and Cornwall there was considerable decrease. One reason for this, without doubt, is found in the low price ruling for the metal. South Africa is now a small producer of tin ore, it having been discovered there in 1893. In that year there were exported 30 tons of ore, in 1894, 141 tons, and in 1895, 246 tons. Mexico produces a small amount of tin, but only sufficient to meet domestic requirements, and there are no accurate statistics of the output. The world's production of tin during 1895 was 83,357 metric tons, of which Australia produced 2235 tons, Austria, 60 tons, Banca and Billiton, 10,932 tons, Bolivia, 4166 tons, England, 6755 tons, Germany, 884 tons, India, 22 tons, Mexico, 30 tons, Singkeep, 654 tons, Straits Settlements, 53,354 tons, and Tasmania, 4262 tons.

There is but one ore of tin of any importance—viz., the binoxide, or stannic oxide, SnO_2 , which in its pure state consists of tin 78, and oxygen 22. It is called *tinstone* or *cassiterite*. Tin ore has nothing remarkable in its appearance; it is of various colors—as gray, various shades of yellow, and red and black. Its specific gravity—a notable

feature—is 6.9; and it strikes fire with steel. In Cornwall the tin ore occurs in mineral veins running through granite and slate rocks, or disseminated in crystals through their mass. The tinstone obtained from the veins or lodes is called *mine-tin*; and that procured by washing alluvial deposits is called *stream-tin*—the latter is the result of the disintegration of granite and other rocks which contained veins of tin. Washed Cornish tin ore, usually called “black tin,” produces on an average about 67 per cent of metallic or “white” tin. Tin pyrites, or sulphide of tin, is found in some of the Cornish mines, but it is of little importance commercially. It may also be stated that ores containing copper are sometimes found with so large a proportion of tin that it is difficult to say whether they should be regarded as tin or copper ores.

The dressing of tin ore obtained from the mine is a difficult and delicate operation. It is so much dispersed through the gangue, that it requires to be stamped to a very fine powder by apparatus described under METALLURGY, before the metallic particles can be effectually separated. So small, comparatively, is the valuable portion of the ore, that at Huel Kitty mine, St. Agnes, not more than 84 lbs. of oxide of tin is obtained from a ton of the material brought to the surface; and in some mines the proportion of oxide to the rest of the material is not so much as 10 lbs. to the ton.

The stamped ore is copiously supplied with water passed through a grating adjoining the stamps, and conveyed into a channel where there are two pits. The purer and heavier portion falls into the first, and is called the *crop*; the remainder, called the *leavings*, passes through the first, and is retained in the second pit. Repeated washings are now necessary to separate as thoroughly as possible the impurities from the ore, and for this purpose a machine called a *buddle* is largely employed. Various kinds of apparatus are, however, used, but they are similar in principle to the jigging sieve and sleeping table described under METALLURGY. We may notice here that a new form of buddle, known as “Borlase’s buddle,” has been recently introduced for dressing tin ores, by which a saving of about 30 per cent is said to be effected. Fig. 1 shows this machine. The ore and earthy matters, in the state of a thick mud, are conveyed by square pipes or channels to the circumference *a, a*, around which, by the aid of water, the metallic portion separates, while the lighter stony impurities flow toward the center, and are carried away. There are brushes at *b, b*, for agitating the ore during the operation. In the older form of buddle, this action is reversed, and the machine, instead of being depressed, is raised in the center.

The tin ore thus far purified has next to be deprived of its sulphur and arsenic; this is done in a reverberatory furnace (q.v.), the flues of which are connected with large condensing chambers, in which the arsenic is deposited in a crystalline form (see ARSENIC), and is afterward resublimed, to form the white arsenic of commerce. The sulphur which is present in the state of sulphide of iron is decomposed by the heat into sulphurous acid gas, and the remaining oxide of iron is removed by a subsequent

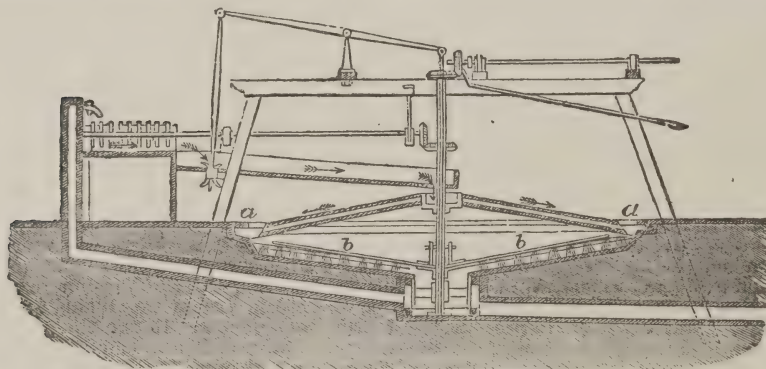


FIG. 1.

washing. Sulphide of copper, when present, is converted by roasting, and afterward exposing it to the air, into sulphate of copper, and is then easily dissolved out by lixiviation.

After this final washing the ore is ready for smelting in a reverberatory furnace. The charge consists of from 20 to 25 cwts. of ore mixed with one-sixth of its weight of powdered anthracite or charcoal, and a small quantity of lime or fluor-spar, to serve as a flux for the siliceous impurities. Before being put into the furnace, the mixture is moistened with water, to prevent the finely-powdered ore being carried away by the draught. When the charge is placed on the hearth of the furnace, the doors are closed, and the heat gradually raised for about six hours; the oxide is then reduced by the carbon of the coal. At this stage the furnace-door is opened, and the mass worked with a

paddle, to separate the slag, which is raked off, and the richer portion of it melted over again. The reduced tin subsides to the bottom, and is run off into a cast-iron pan, from which it is ladled into molds, to produce blocks or ingots of a convenient size.

The tin has still to be purified, first by a process of *liquation*, and afterward by that of *boiling*. "Liquation" consists in moderately heating the blocks in a reverberatory furnace till the tin, owing to its comparatively easy fusibility, melts and flows into the refining basin, leaving on the hearth of the furnace a residuary alloy of tin with iron and other metals. More blocks are added and heated in the same way, till the refining-basin contains about five tons. The tin is then ready for "boiling." In this operation billets of green wood are plunged into the melted metal, the disengagement of gas from which produces a constant ebullition, and so causes a scum (chiefly oxide of tin) to rise to the surface, which is then easily removed; at the same time, impure and dense parts fall to the bottom. When the agitation has gone on long enough, the bath is allowed to settle and cool. The tin then separates into zones—the upper consisting of the purest portion; the middle being slightly mixed with other metals; and the lower so much so that it requires to go through the refining process again. The residuary alloy of the liquation process has also its tin extracted and refined again.

In former times in Cornwall tin was smelted in a blast furnace (q.v.) instead of a reverberatory one; and this is still the case on the continent. By this method a pure tin is obtained, but the loss of metal in the process is greater. It suits best where coal is scarce and wood abundant.

Tin ores which contain the mineral wolfram (tungstate of iron and manganese) are treated by a special process, patented by Mr. R. Oxland, of Plymouth. This mineral and tin ore are so nearly the same in specific gravity, that no mechanical process of washing will separate them. Mr. Oxland's process consists in roasting the dressed tin ore with sulphate of soda, for the purpose of converting the insoluble tungstate of iron and manganese into the soluble tungstate of soda, which is easily removed by lixiviation. The oxides of iron and manganese, which are left in a finely-divided state, can then, from their lower density, be readily got rid of by washing. Since the invention of this process, some of the Cornish tin ores which used to sell at the lowest, now bring the highest price. The tungstate of soda procured in the operation has lately been found to be one of the most valuable substances for rendering cotton cloths noninflammable.

Tin when heated up to nearly its melting-point becomes brittle, and can then be broken into prismatic fragments called *dropped* or *grain tin*. The metal which is susceptible of this change may be considered to be of fine quality, as impure tin does not become brittle when so treated. The peculiar properties of tin, especially its malleability, its brilliancy, and the slowness with which it oxidizes at common temperature in the atmosphere, render it of great service in the arts. Utensils coated with silver require six cleanings for one that would suffice with "tinned" vessels. Tin is consequently very largely used to coat the surface of other metals, as iron and copper, especially thin sheet-iron, to form tin-plate.

With other metals tin forms some valuable alloys. See ALLOY. An amalgam of tin and mercury forms the metallic coating of mirrors. The applications of tin-foil, which is not more than $\frac{1}{1000}$ of an inch in thickness, are well known. From 60 to 80 tons of tin are annually used in Birmingham in the manufacture of coffin-lace.

MANUFACTURE OF TIN-WARE IN THE UNITED STATES.—Tin-ware recommends itself not only on account of its lightness and general convenience, but because of its incorrosibility. It is as bright and handsome as silver, far less expensive, and more serviceable. The milk-pan was, before its advent, a heavy earthen article; the milk and water pail a wooden bucket; the dipper a gourd, or a heavy pewter scoop. The first manufacture of tin-ware in the United States is claimed to have been in Berlin, Hartford County, Connecticut, in 1770, by Edward Patterson, a native of Ireland. As late as 1810, Connecticut supplied nearly the whole United States with wares made of tin. The work was done principally through the agency of peddlers. Extensive manufactures were begun in other parts of New England during the earlier part of the present century and rapidly spread into all parts of the country, until every town, village, and nearly every hamlet in the land has its tin-shop, and in the more rural districts the peripatetic peddler, who often carries around a repairing and manufacturing shop of no mean dimensions. In addition to the immense number of small manufacturers working throughout the country there were found to be in 1880 a total of 7595 large establishments in the United States, where the manufacture of tin-ware was extensively carried on. The same establishments, however, or a great number of them, also manufactured copper-ware and sheet-iron ware. The capital invested was estimated at \$22,252,290.00, and more than 26,000 persons were employed, but it would be impossible to tell the proportion of labor given exclusively to the manufacture of tin-ware, and an attempted approximation might be misleading.

The United States is a large consumer of tin plate whose uses are various. Much of it is required for house-roofing, while the canning of fruits, vegetables, fish, oysters, milk, etc., and the manufacture of domestic utensils demand an enormous supply. Immense numbers of children's toys are manufactured from the same material, the money value of which runs up into the hundreds of thousands annually.

Nearly all the tin-plate of commerce has heretofore been manufactured in Great

Britain, and the plate used in the United States comes very largely from that country. The ore is obtained chiefly from Cornwall although large quantities are imported by Great Britain from Australia, the islands in the Straits of Malacca, also the Malayan peninsula. In 1880 the United States imports of tin in bars, blocks, or pigs, were 14,248 tons, valued at \$6,223,176. The exports of foreign tin of the same kind were 205 tons, valued at \$82,594. There was a steady increase in the imports year by year, when in 1888, the record showed 1,587,029 tons of block tin, valued at \$8,758,562. In the same year there was also of tin-plate imported the enormous quantity of 31,611,214 lbs., having a value of \$19,034,821, making a total value of tin imported in that year of nearly \$28,000,000. In 1895, the imports of tin in bars, blocks, or pigs amounted to 40,484,183 pounds, valued at \$5,713,300.

Tin-plate has heretofore consisted of sheets of iron coated with tin, or a mixture of tin and lead. Some of the stock still imported is of the same material, but steel is rapidly superseding the cheaper material and affording a better and more durable product. The discoveries recently made in South Dakota, Wyoming, and California have been of the black oxide of tin. While showing in the majority of assays a very high grade, and of great value, yet it is not block tin, and no process has as yet been discovered to make it equal in its work to the product of the Cornish mines.

The re-tinning process is carried on in a few localities in the United States. It consists in disintegrating the previous tin-coating by an enormous pressure on the metal, and then re-plating. The article to be re-plated is dipped into a caldron of boiling tallow so hot that the original plating having already been crushed is melted from the surface of the iron. The ware is then dipped into a pot of fused tin where it receives its new coating. Various secondary features of treatment follow, when the article is as good if not better than the original. As processes have improved, and new discoveries been made, instead of cutting the tin-plate into sections, then fitting and soldering them together, mechanical appliances have been devised, patented, and put into successful operation whereby from a single piece of metal or plate, a complete pan, basin, or other article is stamped out, and a household, or other product made, lighter, stronger, more durable, and cheaper than the older style.

In order to stimulate the tin production and manufacture in the United States, the McKinley administration bill imposed upon tin plates a duty of $2\frac{3}{4}$ cts. per pound on and after July 1, 1891, as against an existing duty of 1 ct. per pound; and upon tin ore, which had previously been admitted free of duty, a charge of 4 cts. per pound, to be imposed on and after July 1, 1893. In the tariff act of 1897, tin ore in bars, blocks, pigs etc., is again admitted free and tin plate is taxed $1\frac{1}{2}$ cents per lb.

TINAMIDÆ, a family of *gallinaceous* birds inhabiting the tropical portions of South America, having many remarkable features in their internal organization, and with the striking external character that the tail is exceedingly short or entirely absent. They are intermediate in form between the *phasianidæ* and the *bustards*, having the long neck and legs and small feet of the latter, and the naked scale covering the nostrils, as in the former. They are sometimes classed as a genus of the *tetraonidæ*, or grouse family. See GROUSE. Many of the skull sutures are persistent, the brain is very small, and they have but little intelligence. Mr. Darwin saw many of the *tinamus rufescens* (called by English travelers partridges) while in South America. He says that a man on horseback by riding round them in a spiral, could kill an indefinite number by knocking them on the head with a stick. The more common method, however, was to catch them in a noose made of the stem of an ostrich's feather fastened to the end of a long stick. Of the family there are said to be as many as 41 species, and 9 genera, included in two sub-families, *tinamina* and *tinamotina*, the first containing the genus *tinamus* with 7 species, and the genera *nothocercus*, 3 species; *crypturus*, 16 species; *rhynchotus*, 2 species; *nothoprocta*, 6 species; *nothura*, 4 species; *taoniscus*, 1 species. The second sub-family contains two genera, *eudromia*, 1 species, and *tinamotis*, 1 species. Some of the species inhabit the deepest forests, some live on the open plains.

TINCAL. See BORAX.

TINCTURE. See HERALDRY.

TINCTURES are defined by sir Robert Christison to be "solutions of vegetable and animal drugs, and sometimes of mineral substances, in spirituous liquids." The spirit most commonly employed is proof-spirit; sometimes rectified spirit is used; and occasionally ether. Ammonia is sometimes conjoined with the spirit, in which case the solution is termed ammoniated tincture. (It may be as well to remind the reader that *rectified spirit* is alcohol with 16 per cent of water, and that its specific gravity is .838; and that *proof spirit* is composed of 5 parts of rectified spirit mixed with 3 parts of water, the resulting compound containing about 47.5 per cent of water, and having a specific gravity of .920.) The choice between proof and rectified spirit depends on their respective solvent powers over the active principles of the drugs employed. The ether and ammonia are principally used for their antispasmodic properties. "The form of tincture," says sir Robert Christison, "is one of the best in pharmacy; for the menstruum is a powerful solvent of the active constituents of drugs; it presents them in small volume; it preserves them very long unaltered, and it is for the most part a convenient medium for uniting them with other substances in extempore prescriptions."

TINDAL, Dr. MATTHEW, a notable deistical writer, was the son of a clergyman at Beer-ferris, in Devonshire, where he was born about 1657. He was educated at Lincoln and Exeter colleges, Oxford; took the degree of B.A. in 1676; and shortly after was elected fellow of All Souls' college. In 1685 he became a doctor of law; and, after a brief lapse into Romanism during the reign of James II., reverted to Protestantism, or rather, as events showed, into rationalism. His first work was entitled *An Essay concerning Obedience to the Supreme Powers, etc.* (Lond. 1693); followed in the course of a few months by *An Essay concerning the Laws of Nations and the Rights of Sovereigns*; but it was not till 1706 that he attracted any particular notice, when the publication of his treatise on *The Rights of the Christian Church asserted against the Romish and all other Priests who claim an independent power over it; with a Preface concerning the Government of the Church of England, as by Law established*, raised a storm of opposition, that may, perhaps, be considered to have fulfilled the prediction of the author, who told a friend that "he was writing a book which would make the clergy mad." A perfect torrent of replies and refutations poured from the press. Among those who signalized themselves as the adversaries of Tindal, the least obscure were Dr. G. Hickes and Conyers Place. Swift, it may be noticed in passing, also indulged in some "Remarks." On the continent, Tindal's work was quite differently received. Le Clerc, in his *Bibliothèque Choisie*, praises it very highly, as one of the solidest defenses of Protestantism ever written. In 1730, when he had nearly reached the age of 73, he published his most celebrated treatise, entitled *Christianity as old as the Creation, or the Gospel a Republication of the Religion of Nature*, which effectually settled the question of his religious creed. The design of the work is to strip religion "of the additions which policy, mistake, and the circumstances of the time have made to it,"—in other words, to eliminate the *miraculous* element, and to prove that its morality, which is admitted to be worthy of an "infinitely wise and good God," is its true and only claim to the reverence of mankind. Tindal's purpose was rather constructive than destructive; and it was on this account that he called himself a "Christian Deist." He was answered, among others, by Dr. Waterland, Mr. Foster (an eminent dissenting minister), Dr. Conybeare (afterward bishop of Bristol), and Dr. Leland (q.v.), with various degrees of ability and success. Tindal's book is written in excellent English, and is unquestionably a very able performance, giving its author a distinguished place among the 18th c. deists. Tindal died Aug. 16, 1733.

TINDER, an inflammable material, usually made of half-burned linen. It was formerly one of the chief means of procuring fire before the introduction of chemical matches. The tinder was made to catch the sparks caused by striking a piece of steel with a flint; and the ignited tinder enabled the operator to light a match dipped in sulphur. This intermediate step was necessary in consequence of the impossibility of making the tinder flame. Partially decayed wood, especially that of willows and other similar trees, also affords tinder; and certain fungi furnish the German tinder, or Amadou (q.v.).

TINEA is a term somewhat vaguely employed to designate certain parasitic diseases of the skin, and especially of the scalp. Three of the most important varieties of tinea, viz., *tinea circinata* (ringworm of the body), *tinea tonsurans* (ringworm of the scalp), and *tinea sycosis* (ringworm of the beard), have been already described in the article Ringworm (q.v.). In these three varieties, which are included in the general term *tinea tonsdens*, the vegetable parasite known as *trichophyton tonsurans*, figured in the above article, is always present. It now remains to notice the *tinea decalvans* of Bateman, known also as *porrigo decalvans*, *alopecia circumscripta*, etc. It is defined by Aitken as "a fungus disease, causing the formation of rounded or oval patches of baldness, sometimes solitary, more generally multiple. It affects the hairy scalp principally; but the beard and hairy portion of the skin may also suffer."—*The Science and Practice of Medicine*, 2d ed. vol. i. p. 925. The fungus which causes these patches of baldness was detected by Gruby in 1843, and named the *microsporon audouini*. It differs from the *trichophyton* by its numerous waved filaments, and the extremely small size of its sporules, and likewise by its position, not being found in the interior of the root of the hair, but forming a little tube round each hair, and thus causing it to soften and break down. The hairs thus affected become dull and partially loose; the skin in which they are implanted becomes red, swollen, and slightly itchy; and a whitish matter (the sporules of the fungus) may soon be observed on the diseased skin and hairs. The hairs then suddenly fall off from the affected part, leaving a round bald patch of a very white color. The disease is capable of transmission from one person to another, although less readily than *tinea tonsurans*. It chiefly affects children. The treatment consists in preventing the spread of the disease by extracting the hairs round the circumference of the patch, and washing the head daily with soft soap; and all the young hairs within the patch must be extracted till a healthy crop begins to appear. Moreover, a solution of sulphurous acid, as recommended for ringworm, should be applied. When by these means the fungus has been destroyed, stimulants must be applied to the bald patches. A mixture of equal parts of *collodium* and of *ether cantharidalis* (*collodium vesicans*) is, according to Dr. Aitken, the most useful stimulant in these cases.

TINEIDÆ, a family of small moths, the smallest insects of the lepidopterous order. The body is long and slender, the wings entire, often narrow, mostly convoluted in repose. Many of them are very brilliantly colored, exhibiting beautiful little stripes and

patches of gold and silver. Many deposit their eggs in animal substances, on which the larvæ feed, making cases for themselves out of the substance they feed on. The clothes moths (q. v.) are a familiar example.

TINGI, *Magonia glabrata*, a tree of the natural order *sapindaceæ*, which covers large tracts of country in some parts of Brazil, to the exclusion of almost everything else, generally growing to the height of 30 or 40 ft., but sometimes much higher. An infusion of the bark of the roots is used to poison fish. The fruit is a large dry triangular capsule, filled with broad flat seeds, from which a kind of soap is made. The membrane which covers the cotyledons is stripped off, and they are steeped in water till they begin to swell and soften, and boiled with a little tallow. A homogeneous mass is formed, which is used for washing clothes.

TINNÉ, a name given to the tribes of Indians of the Athabaskan family, inhabiting the portion of land lying between Hudson's bay and Central Alaska. They number about twenty tribes, the most prominent of which are the Chippewyans or Montagnais, the Dog Ribs, Beavers, Taculies or Carriers, Yellow Knives, Kenai, Brushwood, and Rocky Mountain Indians. They are peaceful, and subsist on game and fish; their weapons are of stone or bone, of simple construction. The Chippewyans do not bury their dead; the Taculies burn them. They are tall, have dark complexions and full faces, with considerable beard.

TINNEVELLY, *Tiru-nel-vēli*, chief t. of the British district of the same name, is situated near the river Chindinthoora, in lat. 8° 44' n. The town of Tinnevely is connected with the town and military station of Pallamcottah, on the opposite bank of the river. Pop. '91, 24,678.

TINNITUS AURIUM is the Latin translation of, and ordinary medical term for, ringing in the ears. In most cases it is an unimportant symptom, depending on some local temporary affection of the ear, or on some disturbance of the digestive system with which the part of the brain, from which the auditory nerve springs, sympathizes, or which excites the cerebral circulation (as often occurs in the morning after too liberal evening potations); but as it is also a common symptom of organic disease of the auditory nerve, it may indicate a dangerous condition, or may be a prelude to complete deafness. Hence, although commonly of no consequence, it is a symptom that, especially if permanent, must be carefully watched. It may be readily induced for a few hours by a large dose of quinia.

TINOCERAS, an extinct genus of herbivorous mammals from the cocene formation of Wyoming and Utah, the first known members of the new order *dinoceraæ*, so named from the best known genus *dinoceras*, which may be regarded as the typical one, and characterized as follows: Skull long and narrow; facial portion much extended. The upper surface of the skull has three pairs of bony processes, which are regarded as having been the support of horns (whence the name "terrible-horned"). The smallest pair are near the end of the nasal bones; a larger pair spring from the cheek bones in front of the orbits; the largest pair are on the cranial parietal bones, and are situated upon a large crest or ridge which extend from near the orbits around the lateral and posterior margins of the cranium.

TINOS, or **TINO** (anc. *Tenos*), an island in the Grecian archipelago, belonging to the group of the Cyclades, lies immediately s.e. of the island of Andros, 53 m. off the coast of Boeotia. It is 18 m. long, 8 m. in extreme breadth, has an area of 79 sq. m., and a pop. '89 of 11,442. The Tenians were conspicuous among the ancient Greeks for their industry, and they still maintain their pre-eminence in that respect. The island is carefully cultivated, well-watered, has a delightful climate, and is very productive in silk, wine, barley, and fruits. Silk gloves and stockings are manufactured; and the inhabitants have made themselves famous as workers in marble, which is found in the island. In the modern town of Tenos, or St. Nicholas, is a cathedral built of white marble, and famous as a resort for pilgrims.

TIN-PLATE. See **TIN**.

TINTERN ABBEY, a famous ecclesiastical ruin on the right bank of the Wye, in Monmouthshire, about 17 m. n.w. of Bristol. The abbey—properly so called—was founded in 1131 for Cistercian monks, by Walter de Clare, and dedicated to St. Mary; but already in the previous century a church had been built, and in 1268 mass was celebrated by abbot and monks for the first time. The style of architecture is a transition from early English to decorated, and is very fine. Most of the building, except the roof and tower, remains. Tintern abbey owes not a little of its celebrity to Wordsworth's poem, entitled *Lines Composed a few Miles above Tintern Abbey, on Revisiting the Banks of the Wye*—though in reality the poem has nothing whatever to do with the abbey, which is not once mentioned or alluded to in it.

TINTORETTO, a Venetian historical painter, so called from the fact of his father being a dyer (*tintore*), but whose real name was **JACOPO ROBUSTI**, b. 1518, d. 1594. He studied for a short time under Titian, but appears to have been for the most part self-taught. His motto was a very fine one: *Il disegno di Michael Angelo e 'l colorito di*

Tiziano (The design of Michael Angelo, and the coloring of Titian); but it cannot be said that he adhered to it, and he is certainly a long way inferior to either artist. Still, his assiduity, when young, in acquiring a varied knowledge of the human figure under all possible aspects of light and shade, commands respect, in spite of the theatrical means to which he often resorted; and the rapidity of his pencil (which got him the name of *Il Furioso*) is at least astonishing. Sebastian del Piombo remarked that Tintoretto could paint as much in two days as he could do in two years. A catalogue of Tintoretto's works, specimens of which are to be found in almost all galleries, is impossible within our limits. We can only mention a few of the more famous, as "Belshazzar's Feast, and the Writing upon the Wall" (fresco for the arsenal at Venice), "The Tiburtine Sybil," "The Last Supper and the Washing of the Disciples' Feet," "A Crucifixion," "The Worship of the Golden Calf," "The Last Judgment" (the last two immense pictures, 50 ft. high, and very splendid in conception), "St. Agnes Restoring to Life the Son of a Prefect," "The Miracle of St. Mark," a "Resurrection of Christ," "The Slaughter of the Innocents," and a grand picture of "Paradise"—34 ft. high by 74 long, with upward of 100 figures. Some of Tintoretto's earlier pictures are very carefully finished, but his later ones are dashed off with a fatal haste, that justifies the remark of Annibal Caracci, that if he "was sometimes equal to Titian, he was often inferior to Tintoretto." Tintoretto lavishly indulged in *chiar' oscuro*, but his coloring is not gay or brilliant; it is rather cold and leaden, as might be expected of a painter who, when asked what were the prettiest colors, replied: "Black and white."

TIN WEDDING. See WEDDING ANNIVERSARIES.

TIOGA, a co. in s. New York, adjoining Pennsylvania, drained by the n. branch of the Susquehanna river, and by Owego and Cayuta creeks; traversed by the Delaware, Lackawanna, and Western, the Erie and the Lehigh Valley railroads; about 498 sq. m.; pop. '90, 29,935. The principal productions are oats, wheat, corn, buckwheat, wool, and butter. Manufacturing is extensively pursued. Co. seat, Owego.

TIOGA, a co. in n. Pennsylvania, adjoining New York; drained by the Tioga river, and by Pine and Lycoming creeks; crossed by the Fall Brook and the Erie railroads; about 1120 sq. m.; pop. '90, 52,313, chiefly of American birth. The surface is hilly and well wooded. Iron and coal abound. The soil is suitable for grazing. The principal productions are oats, corn, wheat, buckwheat, maple sugar, and butter. There are extensive manufactures. Co. seat, Wellsboro.

TIPPAH, a co. in n. Mississippi, adjoining Tennessee; drained by Tippah creek, and the Tallahatchee and Hatchee rivers, traversed by the Gulf and Chicago railroad; about 490 sq. m.; pop. '90, 12,951, includ. colored. The surface is rolling. The soil is fertile. The principal productions are corn, cotton, wheat, wool, butter, and cattle. Co. seat, Ripley.

TIPPECANOE, a river of Indiana, which rises in a lake of the same name in the northern part of the state, flows s.w. 200 m., and empties in the Wabash, 9 m. above Lafayette. It is famous for the battle fought on its banks, Nov. 7, 1811, in which the Indians, under Tecumseh's brother, the Prophet, were defeated by Gen. Harrison.

TIPPECANOE, a co. in w. Indiana, drained by the Wabash river, the Tippecanoe river, and several creeks; traversed by the Cleveland, Cincinnati, Chicago, and St. Louis, the Lake Erie and Western, the Louisville, New Albany, and Chicago, and the Wabash railroads; about 500 sq. m.; pop. '90, 35,078, chiefly of American birth. The surface is level. The soil is productive. The principal productions are corn, wheat, oats, butter, and wool. There are extensive manufactures. Co. seat, Lafayette.

TIPPECANOE, BATTLE OF, fought Nov. 7, 1811, in Indiana, on the banks of Tippecanoe river, on the site of the present village of Battle Ground, between the Americans under Gen. Harrison, and the Indians under the Prophet, Tecumseh's brother.

TIPPERARY, an inland county of the province of Munster, Ireland, bounded on the s. by Waterford; and on the w. by Cork, Limerick, Clare, and Galway. Area, 1659 sq. m., or 1,061,731 acres, of which 225,000 acres were under cultivation in 1893. Pop. 91, 177,308.

The county of Tipperary, for the most part lies in the basin of the river Suir. This river rises near Templemore, in the n. of the county; and after traversing Tipperary for a distance of about 76 m., forms for a time its boundary with Waterford; through which county it ultimately passes to the sea. The other rivers of Tipperary are the Nore, the Nenagh, and the Brosna. The lakes are numerous, but of small size. The county is intersected by the Great Southern and Western, and the Limerick and Waterford railways. The surface is generally plain, and the mountains which diversify it are rather groups than portions of any connected range. These mountains are the Galtees, rising to 3,000 ft., Knockmeledown (2,700 ft. high), and Slievenam on the s.; Keeper mountain, 2,100

ft. high, and its group on the w.; and the Slievardagh Hills on the east. There is one very curious isolated height called the Devil's Bit, to which many popular legends attach. The soil of the plain is a rich calcareous loam, singularly fertile and productive, especially a district called the Golden Vein, in the center of which stands the town of Tipperary (q.v.), and which extends from Limerick to the county of Kilkenny. There is another similarly fertile district in the n. of the county. In geological formation the plain belongs to the great central limestone district. The mountains are for the most part of clay-slate, surrounded or surmounted by sandstone; the Galtees, together with a contiguous group called Slievenamuck, as well as the intervening valley, being sandstone. There is a large amount of bog in the central and eastern districts, one continuous tract extending a distance of 30 miles. The mineral productions are coal (anthracite), copper, and lead, also zinc and very good fire-clay; and slates of an excellent quality are quarried near Killaloe. Wheat was formerly grown in large quantities; but of late years dairy-farming and the raising of cattle have been rapidly taking the place of the production of cereals. Flax is but sparingly produced.

The county, which sends four members to the house of commons, is divided into two ridings, n. and s., each of which is subdivided into six baronies.

Anciently, Tipperary formed a part of the two distinct principalities of Ormond, or n. Munster, and Desmond, or s. Munster: after the English invasion, Tipperary was formed into a county by king John in 1210; but the authority of the conquerors was long little more than nominal. Eventually, it came to be divided between the Anglo Norman families of Butler, which held Ormond, and Geraldine, to whom a portion of Desmond fell. The antiquities are numerous, as well Celtic as Anglo-Norman. In the latter, the city of Cashel is specially rich; and the ruin of Holy Cross is a noble specimen of the monastic remains of the mediæval period, as the castle of Cahir is of the military and baronial architecture of the same age. There is a series of caves near the border of the co. of Cork, in the vicinity of Mitchellstown, which attract much notice as a natural curiosity. They consist of a number of chambers and galleries formed by stalactite deposits, one portion of the range being no less than 870 ft. in length.

TIPPERARY, a market t. of the county of the same name, on the river Arra, 111 m. s.w. from Dublin by the mail-coach road, and 110 by the Great Southern and Western railway, with which it is connected by the Limerick and Waterford railway. Tipperary occupies a central position in a fine county, and carries on, therefore, an extensive trade in butter. Pop. '91, 6,391. The town is of very ancient foundation, and soon after the invasion was occupied as a strong place by the English, who built a castle in it during the Irish expedition of king John. This castle, however, fell soon afterward into the hands of the Irish under the prince of Thomond. The town is well built, but of no architectural pretensions, and contains Roman Catholic and Protestant churches, national schools, and a school of the Erasmus Smith endowment.

TIPPOO SAHIB, Sultan of Mysore, and son of Hyder Ali (q.v.), was b. in 1749. Efforts were made to carefully instruct him in the various branches of learning cultivated by Mohammedans; but Tippoo much preferred the practice of athletic exercises, and the companionship of the French officers in his father's service, from whom he acquired a considerable acquaintance with European military tactics. This knowledge he put to effective use during his father's various wars, by completely routing Col. Bailey at Perimbakum (Sept. 10, 1780), and (Feb. 18, 1782) Col. Braithwaite on the banks of the Kolerun in Tanjore, though these were his only important engagements with the British forces in which he could boast of success. On the death of his father, he was crowned with little ceremony, returning at once to the head of his army, which was then engaged with the British near Arcot. On April 28, 1783, he captured and put to death most of the garrison of Bednore; but news of the peace between France and England having reached his French allies, they retired from active service, and Tippoo ultimately agreed to a treaty (Mar. 11, 1784), stipulating for the *status quo* before the war. During the continuance of this peace, he occupied himself in regulating the internal administration of Mysore, sent ambassadors in 1787 to France to stir up a war with Britain, and failing in this, at length so far allowed his inveterate hatred of the English to overcome his judgment, as to invade (April, 1790) the protected state of Travancore. In the ensuing war (1790-92), the British, under Col. Stuart and Lord Cornwallis, were aided by the Mahrattas and the Nizam, who detested their powerful and aggressive neighbor equally from fear and religious hatred (Tippoo being a fanatical Mohammedan); and though the tactics of the sultan in laying waste the Carnatic almost to the very gates of Madras baffled his opponents for a time, he was ultimately compelled (Mar. 16, 1792) to resign one-half of his dominions, pay an indemnity of 3,030 lacs of rupees, restore all prisoners, and give his two sons as hostages for his fidelity. Nevertheless, his secret intrigues in India against the British were almost immediately resumed; another embassy was sent to the French; and the invasion of Egypt by the latter in 1798, and Tippoo's machinations, having become known to the governor-general almost contemporaneously, it was resolved to punish the perfidious sultan. Hostilities commenced in Mar., 1799; and two months after, Tippoo was driven from the open field, attacked in his capital of Seringapatam, and after a gallant resistance, slain. He was buried in his father's mausoleum. May 5,

1799, during a storm of thunder and lightning, which caused the death of several Europeans and natives. His government of Mysore after 1792 was of a most oppressive character, yet Tippoo was extremely popular, and after his death was esteemed by the Mohammedans as a martyr to the faith of Islam. Of the chief articles of *virtù* with which his palace abounded, many are now in Fife house, Whitehall (having been removed thither from the East India house in Leadenhall street), as also the half of his library, the other half being preserved at fort William, Bombay.

TIP'TOFT, JOHN, Earl of, 1425-70; b. England, educated at Balliol college, Oxford. He was noted for his scholarship and for his patronage of William Caxton, who printed his translation of Cæsar's *Commentaries* and the *De Amicitia* of Cicero. By Henry VI. he was made earl of Worcester and lord-deputy of Ireland, ruling with great severity. In the "war of the Roses" he sided with Edward IV., by whom he was made lord high treasurer and knight of the garter. His cruelty in Ireland and toward his Lancastrian prisoners contrasts strangely with his love of literature and education. He visited Rome and Jerusalem, and brought many valuable manuscripts now in the Oxford libraries. After the Lancastrians came into power he was beheaded for alleged maladministration in Ireland.

TIPTON, a co. in central Indiana, drained by Cicero creek and the Wild Cat river; traversed by the Lake Erie and Western, the Pittsburg, Cincinnati, Chicago and St. Louis, the Chicago and Northwestern, and the Burlington, Cedar Rapids, and Northern railroads; 260 sq. m.; pop. '90, 18,157, chiefly of American birth. The surface is level. The soil is fertile. The principal productions are corn, wheat, wool, and butter. Co. seat, Tipton.

TIPTON, a co. in w. Tennessee, on the Mississippi river, drained by the Hatchie river and other streams; traversed by the Louisville and Nashville and the Illinois Central railroads; about 404 sq. m.; pop. '90, 24,271. The surface is level. The soil is fertile. The principal productions are corn, wheat, oats, and cattle. Co. seat, Covington.

TIPULA AND TIPULIDÆ. See CRANE-FLY.

TIRABOSCHI, GIROLAMO, an eminent Italian author, was b. at Bergamo, Dec. 28, 1731, studied at Monza, and afterward entered the order of the Jesuits. Toward 1766 he was appointed professor of rhetoric at Milan, where he wrote his first work, *Vetera Humiliatorum Monumenta* (1766); and in 1770 succeeded father Granelli in the post of librarian to the duke of Modena. Tiraboschi now availed himself of the rich stores of the ducal library, besides making extensive researches in other archives, to compose his *Storia della Letteratura Italiana (History of Italian Literature)*, which began to appear in 1770, and was finished in 1782 in 14 vols. It embraces the history both of ancient and modern Italy, and is especially valuable for the light which it throws upon the intellectual condition of the Peninsula during the dark ages, and the brilliant period from Dante to Tasso. Tiraboschi ends his elaborate survey with the close of the 17th century. It is impossible to praise too highly the learning and the conscientious accuracy of the author, even although the circumstance that many of the epochs have since been made the subject of minute and special inquiries necessitates a revision of parts of the work. A second edition was edited by Tiraboschi (1787-94), and abridged translations have appeared in French and German. The best edition is that published at Milan (16 vols., 1822-26). A continuation, embracing the literature of the 18th c., was written by Lombardi (*Storia della Letteratura Italiana nel Secolo XVIII.*). Tiraboschi died at Modena, June 4, 1794. Other works by this author are *Biblioteca Modenese* (6 vols., Mod. 1781-86); and *Memorie Storiche Modenesi* (3 vols., Mod. 1793).

TIREE, one of the inner Hebrides, included in Argyleshire, lies 20 m. n. w. of Iona. It is 13 m. long, and over 6 m. in extreme breadth. The surface is low, rising in the n. to little more than 20 ft., and in the s. to about 400 ft. above sea-level. The absence of trees and shrubs gives to the island a bleak appearance. There are numerous small lakes. The soil is very fertile and there is a large plain of good pasture land in the center. Some interest attaches to the island from the number of Scandinavian forts which dot the shores, and from the standing stones, ruined churches, and ancient graves which occur in the interior. Pop. '91, 2600, who support themselves by rearing cattle, fishing, and exporting poultry and eggs.

TIRESIAS, in Greek mythology, figures as a famous prophet, who, according to one legend, was struck blind by the goddess Athena, because he had seen her bathing. Another legend represents Hera as depriving him of his sight because, being made arbiter in a dispute between her and Zeus, he had decided in favor of the latter; when Zeus as a compensation granted him the inner vision of prophecy, and prolonged his life for several generations. He is consequently prominent in many of the mythical stories of Greece, but at last found death by drinking from the well of Tiphossa. Even in Hades Tiresias retained his prophetic power.

TIRLEMONT (Flemish, *Thienen*), a town of Belgium, in s. Brabant, on the Great Geete, 30 m. e.s.e. of Brussels, on the Brussels and Cologne railway. The church of St. Germain, on an eminence, dates apparently from the 9th c., and contains an altar-piece by Wappers. Beer, machinery, woolen stuffs, leather, soap, gin and hosiery are manufactured. Tirlemont was ravaged by Marlborough in 1705; and here the French, under Dumouriez, defeated the Austrians in 1793. Pop. '94, 16,864.

TIRNOVA, a t. in the principality of Bulgaria, on the Jantra, 35 m. s.s.e. of Sistova. It was formerly the chief t. of Bulgaria; and after 1878 (see BULGARIA) was again for a short time the seat of the national government. There are numerous mosques, churches, and synagogues; dyeing is carried on, and silk and coarse cloth are manufactured. The population (1893) was 12,858.

TIRO, MARCUS TULLIUS, the amanuensis (pupil and formerly slave) of Cicero, whose life he wrote and whose letters he collected. He is known chiefly as the inventor of the ancient *stenography* (q. v.). He died 5 A.D., almost a hundred years of age.

TIRYNS, an ancient city of Argolis, in the Peloponnesus, one of the very oldest cities of Greece, situated a short distance s.e. of Argos, near the head of the Argolic gulf. According to the common tradition it was founded by Prætus, a mythic king of Argolis; and its massive walls, like other rude massive structures in Greece of unknown antiquity, were reputed to be the work of the Cyclopes. Prætus is said to have been succeeded by Perseus; and in this place Hercules was believed to have passed his youth. At the time of the Trojan war Tiryns appears to have been subject to the kings of Argos. Some time subsequently to the battle of Plataea (to which the Tirynthians sent troops), probably about the year 468 B.C., the city was taken by the Argives, and entirely destroyed; and after this period Tiryns remained uninhabited, the walls of the citadel only being left standing, the wonder and admiration of later ages. Tiryns affords one of the most interesting specimens of what is called Cyclopean architecture, the ruins of this place, and those of the neighboring city of Mycenæ, being the grandest of all in Greece. The acropolis, or citadel, of Tiryns, was built on the summit of a low, flat, rocky hill, rising abruptly out of the dead level of the plain of Argos, and appears to have consisted of an upper and a lower inclosure of nearly equal size, with an intermediate platform. There were two main entrances, on the e. and on the s. sides, with a postern on the west. The entire circuit of the walls still remains more or less preserved; they are upward of 20 ft. in thickness, and are formed of unhewn stones of enormous size, rudely piled in tiers one above the other, without the use of mortar or cement, the interstices being filled up with smaller stones, so as to make the whole mass solid and compact. There are several covered galleries of singular construction in the body of the wall, on the e. and the s. sides, the roof being formed by sloping the courses of masonry on each side of the passage at an angle to each other. One of them has six recesses, or niches on the outer side of the walls, intended probably to facilitate defense. See Schliemann, *The Prehistoric Palace of the Kings of Tiryns* (1885).

TISCHBEIN, JOHANN HEINRICH WILHELM, 1751-1829; b. Germany; lived for several years in Rome, and from 1790 to 1799 was director of the art academy of Naples. He then returned to Germany and settled in Hamburg. He excelled in painting scenes from animal life, but is best known by his illustrations in *Homer nach Antiken gezeichnet* (1801).

TISCHENDORF, LOBEGOTT FREDERICK KONSTANTIN VON, a very eminent Biblical scholar, was born at Lengenfeld, in Saxony, on Jan. 18, 1815. His labors in search of the best and rarest MSS. in reference to the Bible, in which he was liberally assisted by the Saxon and Russian governments, were exceedingly valuable. Among the most important of his numerous excellent works are the editions of the *Sinaitic MS.* (1862, 1863, 1865), the *Eighth Critical Edition of the New Testament* (1864-72), and the *Monumenta Sacra Inedita* (1854-65). After being an extraordinary and ordinary professor at Leipsic, from 1845, he became professor of theology and of Biblical palæography in 1859, a chair in the latter subject having been instituted for him. He was created a count of the Russian empire, an LL.D. of Cambridge, a D.C.L. of Oxford, etc. He died on Dec. 1, 1874.

TISHOMINGO, a co. in n.e. Mississippi, adjoining Tennessee and Alabama; drained by the Tennessee and Tombigbee rivers and their branches; traversed by the Memphis and Charleston railroad; about 435 sq.m.; pop. '90, 9302. inclu. colored. The surface is hilly. The soil is fertile. The principal productions are corn, butter, tobacco, and cotton. Co. seat, Iuka.

TISSAPHERNES, a satrap of Persia. Artaxerxes II., son of Darius II., being informed by Tissaphernes of the design of his younger brother Cyrus to deprive him of the throne, put him in command of his forces, which met and defeated Cyrus at Cunaxa. As a reward he obtained in marriage the daughter of Artaxerxes, and command of the provinces of which Cyrus had been governor. Attempting to punish the Greek cities which supported Cyrus, he was defeated by Agesilaus in Lydia. Afterward proving treacherous, he was slain by order of Artaxerxes.

TISSOT, SIMON AUGUSTE ANDRÉ DAVID, 1728-97; b. Switzerland; educated at Geneva and Montpellier, and gained a great reputation as a physician at Lausanne, in whose university he was professor. He held the chair of clinical medicine at Pavia, 1780-83. Among his works are *Historia Epidemice Lausaniensis Anni 1755*; *Avis au Peuple sur la Santé* (1761); and *De la Santé des Gens de Lettres, suivi de l'Essai sur les Maladies des Gens du Monde* (1768-70).

TISSUES, ANIMAL, may be either normal or pathological. The most important of these tissues have already been considered in special articles, and we shall here

merely notice the view at present most generally adopted regarding their classification (see HISTOLOGY). The normal tissues are divisible, according to Virchow and his followers, into three groups or categories. We have (1) tissues which consist exclusively of cells, when cell lies close to cell; or (2) tissues in which one cell is regularly separated from the others by a certain amount of intermediate matter, or intercellular substance; or (3) tissues in which the cells have attained specific, higher forms of development, by means of which their constitution has acquired an entirely peculiar type. As illustrations of the first group of tissues, the simple cellular tissues in the modern sense (cellular tissue here being quite distinct from areolar or connective tissue), we may take the epithelial formation, such as occur in the epidermis and the nails, and in the epithelium of mucous and serous membranes, in the crystalline lens of the eyes (which is originally a mere accumulation of epidermis), and in the glands. The second group is formed by the connective tissue, which is composed of intercellular substance, with cells of various forms embedded in it, and includes cartilage, fatty tissue, etc. In the third group, which is somewhat heterogeneous, the structures are usually more or less tubular. This group includes the muscles, nerves, and vessels, and Virchow also places the blood in it. Such an arrangement as this is quite distinct from, and altogether at variance with, those adopted a comparatively few years ago. This arrangement has reference to general histology (*tissues*, properly so called), while *that* has reference to special histology, or the structure of organs in which a combination of various tissues may enter. Thus, the *osseous tissue* of general histology consists of bone cells + calcified intercellular substance, while *bone as an organ* consists of osseous tissue + medullary tissue + periosteum + vessels + nerves; similarly, nervous tissue is by no means identical with cerebral matter, which additionally contains membranes, vessels, etc.

Morbid tissues may be classified upon exactly the same plan as the physiological or normal tissues. The belief is gradually extending that there is nothing peculiar or specific in pathological structures, or, in other words, that every pathological tissue has its physiological prototype, and that "no form of morbid growth arises which cannot in its elements be traced back to some model, which had previously maintained an independent existence in the economy."—Virchow's *Cellular Pathology*, translated by Chance, p. 60. The distinguished pathologist whose words we have just quoted maintains that there is no other kind of heterology in morbid structures than the abnormal manner in which they arise, and that this abnormality consists either in the production of a structure at a point where it has no business, or at a time when it ought not to be produced, or to an extent which is at variance with the typical formation of the body; "but," he adds, "practical experience shows us that it would be altogether incorrect to conclude from the mere correspondence of a pathological tissue with a physiological one that the case would continue to follow a benignant course." The curious bodies provided with large nuclei and nucleoli, which have been described by many pathologists as "the specific polymorphous cells of cancer," are merely irregularly developed epithelial cells, such as occur, for example, in the lining of the urinary passages; and the apparent heterology of other morbid growths may be similarly explained.

TISSUES, VEGETABLE. See CELLULAR TISSUE, VASCULAR TISSUE, and VEGETABLE TISSUES.

TISZA VON BOROSJENŐ, KOLOMAN, prime minister of Hungary, b. Dec. 16, 1830, at Geszt, was educated for the civil service. The revolution of 1848 interfering with his career, he gave some years to travel. In 1850 he became known as an opponent of the policy of religious intolerance which was pursued by the Hungarian government. He gained a seat in the parliament of Hungary in 1860, succeeding Count Teleki. In 1875 he was able to carry over the moderate radical party, with which he had allied himself, to the United Liberals under Deák, and became, first, minister of the Interior, and then Prime Minister of the Hungarian Cabinet. In 1876-8 he opposed Russia and Pan-slavism. He resigned when Austrian finances did not meet the expenses of the Bosnian occupation, but returned to his position in 1889, and retired 1890.

TIT, or **TITMOUSE**, *Parus* a genus of birds of the order *insectores*, tribe *corvirostris*, and family *paridae*. The *paridae* are small birds, of which there are more than 50 known species, widely distributed throughout Europe, Asia, Africa, and North America. They are more numerous in cold and temperate than in tropical regions, those which are found within the tropics being mostly inhabitants of elevated mountainous districts. The bill is small, short, somewhat conical, the tip entire, the base beset with hairs, and the nostrils generally concealed by feathers. The wings are not very long, but are pointed; the tail is rounded or even; the tarsi long, slender, scaled in front, the inner toe shortest, the claws long and curved. The plumage is beautiful, often gay. The popular names tit and titmouse are very generally given to all the *paridae*. They are bold sprightly birds, extremely active, flitting from branch to branch, running rapidly along branches in quest of insects, and often clinging to the under-side of branches with their back downward. They feed not only on insects but on grain and seeds, have no objection to carrion, and sometimes kill young and sickly birds by strokes of their bill. They are very pugnacious, and the female tit shows great courage in defense of her nest, often continuing to sit when the nest is approached, and vigorously assailing the intruding hand with her bill. In winter many of the species gather into small flocks.

and approach houses and villages, competing with sparrows and chaffinches for a share of the food of domestic poultry. Most of the tits lay at least six eggs, some of them twelve or more, and even in temperate countries they often produce two broods in a year. They generally build in trees. The young are fed chiefly on caterpillars. A pair of blue tits have been observed to carry a caterpillar to their nest, on an average, every two minutes during the day, so that these birds must be extremely useful in preventing the multiplication of noxious insects. Seven species are found in Britain, but one of them, the CRESTED TIT (*parus cristatus*) is a mere accidental visitor. The GREAT TIT (*P. major*) is the largest European species. It is common in almost all parts of Europe. It is not quite six inches long; the head and throat are black; the cheeks are white; the back, breast, and sides yellowish; the wings and tail grayish. Its usual note is a kind of chatter, but it sometimes imitates the notes of other birds. The BLUE TIT (*P. cæruleus*) and the COLE TIT (*P. ater*) are very common in Britain. The blue tit is perhaps the most pert and audacious of all the British species. It very generally receives the familiar name of *tomtit*. The upper part of the head is light blue, and a bluish tinge prevails in the plumage. The CHICKADEE or BLACK-CAP TIT (*parus atricapillus*) is very common in North America. The TUFTED TIT (*lophophanes bicolor*) is the largest American species. See CHICKADEE. See illus., LARKS, ETC., vol. VIII.

TITANIUM (sym. Ti, atomic weight—new system, 48—sp. gr. undetermined) is a comparatively rare metal, which, according to the method by which it is procured, occurs as a gray, heavy, iron-like powder, which burns with brilliant scintillations in the air, and is converted into titanitic acid, or in prismatic crystals. At 212° F. (100° C.) it decomposes water, and it is soluble in hydrochloric acid. It is obtained in the crystalline form by heating sodium with dry potassium titanofluoride. It never occurs native, but is found in association with other elements in various minerals, of which the most important are *anatase*, *rutile*, and *brookite*, containing titanitic acid; *titanite*, containing silicate of lime and titanitic acid; *perovskite*, containing titanite of lime; *æschynite*, containing titanitic and niobic acids, and the oxides of cerium and lanthanum; and lastly, *titanic iron*, composed of titanate of protoxide of iron. A remarkable artificial compound of the metal is often found in the form of copper-colored cubic crystals, adhering to the slags of iron furnaces. They are hard enough to scratch agate; and no acid except a mixture of nitric and hydrofluoric acids has any action on them; but they are volatile at an extremely high temperature. They consist of a combination of cyanide with nitride of titanium, and are represented by the remarkable formula, $Ti(CN)_2 + 3Ti_2N_2$. The most important compound of this metal is *titanic acid*, TiO_2 , which occurs in the minerals *menaccanite* and *iserine*, as titanate of iron, but is more common in the uncombined state, as titanitic anhydride, in the form of *rutile*, *brookite*, and *anatase*, each of which possesses a distinct crystalline form, and has a different specific gravity. Hence titanitic acid in the anhydrous state is trimorphous. It is usually obtained by a somewhat complicated process from *rutile*. Titanium was discovered by Gregor, as a constituent of *menaccanite*, in 1791.

TITANOSAURUS, or ATLANTOSAURUS, a genus of extinct reptiles belonging to the order *Dinosauria* (q.v.), and therefore allied to *hadrosaurus* (q.v.), *megalosaurus* (q.v.), and *iguanodon* (q.v.). Their fossils are found in the Jurassic formations of North America. The *Atlantosauros montana* from Colorado, according to Prof. Marsh, "is by far the largest land animal yet discovered, its dimensions being greater than was supposed possible in any animal that lived and moved upon the land. It was some 50 or 60 ft. in length, and when erect, at least 30 ft. in height.

TITANOTHERIUM, an extinct genus of mammals from the "bad lands" of White river, S. Dakota, probably of the miocene formation. They were discovered by Dr. H. A. Prout, and named by Dr. Leidy *titanotherium Proutii*. They belong to the extinct family *brontotheridæ*, which includes as many as four genera, *titanotherium*, *megacerops* (q.v.), *brontotherium*, and *diconodon*. The best known genus is *brontotherium*, having the following characteristics: skull long and depressed, resembling that of the rhinoceros; large horn cores in front of the orbits, on the maxillary bones, and having large air cavities, nasal bones large and firmly ossified together; occipital condyles large and widely separated; dental formula; $i \frac{2-2}{2-2}$; $c \frac{1-1}{1-1}$; $pm \frac{4-4}{3-3}$; $m \frac{3-3}{3-3}$. Upper incisors small; canines short and stout with no diastema between them and the molars. The upper molars are large grinding teeth, often measuring 5 in. in diameter; brain cavity small in proportion to the skull, the cerebral hemispheres not extending over the cerebellum, and only to a small extent over the olfactory lobes; hemispheres comparatively large and much convoluted; cerebellum small, indicating clumsiness in motion; atlas or first cervical vertebra large and having great transverse extent; axis large, with massive odontoid process; lumbar vertebrae smaller than dorsal. There were four sacral vertebrae, and the caudal bones indicate a long and slender tail; limbs intermediate between elephant and rhinoceros; carpal bones shorter than in rhinoceros, supporting four stout toes, radius and ulna, and also tibia and fibula, separate; *os calcis* long, astragalus short. The hind feet had three toes of nearly equal size. None of the bones of the skeleton were hollow; nose probably flexible and tapir like, and not a true proboscis.

cis. These animals nearly equaled the elephant in size. The fossils of *brontothervidæ* are all as far as known from miocene beds of Dakota, Nebraska, Wyoming, and Colorado. Prof. Marsh, who discovered these extinct forms in these regions, remarks that the name *titanotherium* must give way to the previously applied name *menodus*.

TITANS AND TITANIDÆ (originally called *Ouraniones*, celestials), in Greek mythology, were the sons and daughters of Uranus (heaven) and Gæa (earth). Their names as commonly given, were: Oceanus, Cœus, Crius, Hyperion, Iapetus, Kronos, Theia, Rhea, Themis, Mnemosyne, Phœbe, and Tethys; Dione, Phorcys, and Demeter are added by some writers. Instigated by their mother, the Titans, headed by Kronos, rose against their father, emasculated and deposed him, and liberated their brothers the Hecatoncheires (hundred-handed) and the Cyclops (q.v.) from Tartarus. Kronos being made king, threw the Cyclops back again to Tartarus, and married his sister Rhea. In order to escape being deposed by one of his own children, as it was foretold he would be, Kronos swallowed each as it was born. Rhea, when she gave birth to Zeus (q.v.), saved his life by giving a stone wrapped in a cloth to Kronos, who swallowed it, believing it to be his child. Zeus, when he grew up, gave his father a potion which caused him to vomit the stone and the children he had swallowed. Assisted by his brothers and sisters, along with the Cyclops and Hecatonchieres, Zeus began with the Titans the ten years' conflict which resulted in the complete triumph of the former and the overthrow of the latter, who were hurled down into a dungeon below Tartarus, surrounded by a brazen wall, and guarded by the Hecatoncheires. During the war Zeus and his allies occupied mount Olympus in Thessaly, his opponents being encamped on mount Othrys. The name Titan is also given to the descendants of the Titans, such as Prometheus, Hecate, Helios, Selene, etc.

TITE, Sir WILLIAM, 1802-73; b. London, England; studied architecture under Laing. His first work was the rebuilding of the church of St. Dunstan's-in-the-East in the Gothic style. This at once established his fame. Among his best designs was that of Edward Irving's church in London. In 1855 he was returned to parliament from Bath as a liberal, and was made a member of the banking committees. His title was bestowed in 1869. In 1848 he published a catalogue and description of the antiquities found in the excavations for the royal exchange, of which he was architect.

TITHES (A. S. *teotha*, a tenth; Lat. *decima*, i.e., *pars*, a tenth part), the tenth part of the produce of the land, which, by ancient usage, and subsequently by law, is set aside for the support of the clergy, and other religious uses. This provision for the clergy passed at a very early period from the Jewish into the Christian church, and indeed the same or some analogous appropriation has been traced in the other ancient religions. It is observable under the patriarchal system in the words employed by Jacob (Gen. xxviii. 22), and in the offering of Abraham to Melchisedec (Gen. xiv. 20); and mystical reasons have been devised for the selection of the tenth part, rather than any other fractional portion of the produce of the earth, to be consecrated to the uses of religion and the ministers of religion. (See Spencer, *De Legibus Hebræorum*, iii. 1 to 10.) The details of the institution among the Jews will be found in Levit. xxvii., Deut. xiv., and many other places. The tribe of Levi not having lands assigned, as was the case with the other tribes, drew their support from this impost.

In the Christian dispensation the very circumstance of the existence of the clergy as a distinct class supposed a certain fixed provision for their maintenance. The necessity of such provision, and the right on which it is founded, is distinctly expressed in many passages and allusions of the New Testament, as Matt. x. 10, Luke x. 7, Rom. xv. 27, 1 Cor. ix. 7 to 14. The obligation in the general sense which these passages involve has been put forward in ecclesiastical legislation from the earliest period. The apostolical canons, the apostolic constitutions, St. Cyprian on *The Unity of the Church*, and the works of St. Ambrose, St. Chrysostom, St. Augustine, and the other fathers of both divisions of the church, abound with allusions to it. As yet, however, this obligation was discharged mainly in the form of voluntary offerings; and the legislation of the first Christian emperors, while it presupposed the duty of maintaining the clergy, and even assigned lands and other property for their support, did not extend to any general enactment for the payment of the tenth of the produce of the lands. The council of Tours, 567 A.D., the second council of Macon, 585, that of Rouen, 650, of Nantes 660, of Metz, 756, and some others, distinctly sanction that form; and at length Charlemagne by his capitularies formally established the practice within those portions of the ancient Roman empire to which his legislation extended.

From this and other sources the payment of a tenth to the church extended throughout western Christendom. By some the claim was held to be of divine law; by others, of human institution; but in the gradual progress of relaxation it came to pass that the right thus established solely for the church began to be usurped for themselves and for purely secular uses by nobles or other powerful laymen. See **IMPROPRIATION**.

The first introduction of tithes into England is ascribed to Offa, king of Mercia, in the close of the 8th century. The usage passed into the other divisions of Saxon England, and was in the end made general for all England by Ethelwulf. It would seem that, at first, although all were required to pay tithes, it was optional with each to select the church to which his payment should be made; but by a decretal of Innocent III.,

addressed to the archbishop of Canterbury in 1200, all were required to pay tithes to the clergy of their respective parishes, and this parochial distribution of tithes has ever since obtained in England. The ancient canon and civil law distinguishes many varieties of tithes, into which we shall not enter, as royal, indominate, fiscal, salic, etc. We shall confine our remarks to the provisions of the English law, premising that in most respects it is founded upon the general principles of the civil and canon law.

Tithes are of three kinds—*predial*, *mixed*, and *personal*. Predial tithes are those which arise immediately from the earth itself, as of grain of every kind, fruits, and herbs. *Mixed* tithes are those proceeding from things nourished by the earth, as calves, lambs, pigs, colts, chickens, milk, cheese, eggs, etc. *Personal* tithes are those arising from the profits of personal industry, in the pursuit of a trade, profession, or occupation; but it is commonly held that personal tithes were ordinarily paid in the form of a voluntary offering at Easter or some other period of the year. From these explanations, it will be understood that no tithe was due from the proceeds of mines or quarries, as their produce is not the result of any growth or increase of the earth, but forms part of its substance; nor from houses, as having no annual increase. The common law, moreover, held wild animals, game, fish, etc., not to be proper subjects of tithe, as also tame animals kept for pleasure or curiosity, and not for profit or use.

A more arbitrary distinction is into *great* and *small* tithes, the first being tithes of corn, hay, wood, etc.; the second being the other kinds of prædial tithes, as well as all personal and mixed tithes. This distinction, although purely arbitrary, is important, inasmuch as the great tithes of a parish belong to the rector (q.v.), and the small tithes to the vicar (q.v.). Tithes were originally paid "in kind;" that is, by the actual numeration of the products of the land, and the apportionment in each of the numerical tenth part, as of the tenth sheaf, the tenth lamb, calf, etc. The inconvenience and trouble, as well as the unsettled and variable quantities involved in this mode of payment, led to early attempts to provide other modes of apportioning the result (the particular manner being called technically a *modus decimandi*, or simply a *modus*). This was done either by making an agreement to pay a fixed quantity irrespective of actual produce in each year, or by a money payment settled between the parties; or by a partial substitution of payment or labor, as when the party contributed a smaller quantity of produce, but free from the expense of harvesting, carriage, etc.; or finally, by a payment of a bulk sum in redemption of the impost, either for a time or forever, as the case might be, in which case the land so redeemed became temporarily or permanently tithe-free. By such compositions, many lands in England were made anciently tithe-free, and have so continued; but by 1 Elizabeth 19, and 13 Elizabeth 10, such alienations of tithe-payment were restricted to a term of twenty-one years, or three lives.

Besides the exemption from tithe thus created, a still more comprehensive occasion of immunity is traceable to the exemption enjoyed by the lands of religious houses. Originally, convents occupying lands in England paid tithes like other land-owners to the parochial clergy; but a decretal of Paschal II. exempted them from such payments in regard to lands held by themselves in their own occupation. This exemption was confined by subsequent legislation to the four orders—templars, hospitaliers, Cistercians, and præmonstratensians, and after the 4th council of Lateran (1215), only in respect of lands held by them before that year. Frequently, however, exemptions were given in favor of particular houses; and in cases in which religious communities were themselves the incumbents of a parish, as they could not pay tithes to themselves, their own lands within such parish became exempt by what was called "unity of possession." And thus it came to pass that a large extent of land in England and Wales was held free of tithes. Now, when, on the suppression of monasteries, those lands were assigned to lay possessors, they passed of course into lay hands with the same immunity; and hence this exemption from tithe has become perpetual even in the hands of lay possessors, as, on the other hand, by a similar transfer, lay proprietors have in many instances acquired the right to tithe, and the property of many rectories.

The arrangements between parties for commuting the mode of payment, to which allusion is made above, were permitted, and even protected by law; but they were nevertheless purely voluntary and partial, and the perpetually recurring contests to which the system led, as well as the oppressive nature of the exaction when the parties from whom it was claimed did not belong to the church established by law, rendered the impost odious; and in Ireland it became impossible to enforce its collection in great part of three of the four provinces. A measure of commutation became absolutely necessary. This had been recommended by committees as far back as 1822, but it did not pass into law until 1838. Various statutes for England or Ireland have since been enacted regulating the payment of tithe—6 and 7 Will. IV. c. 71, 7 Will. IV. and 1 Vict. c. 69, 1 and 2 Vict. c. 64, 2 and 3 Vict. c. 32, and 5 and 6 Vict. c. 54. Their object for England is to substitute a money rent-charge, varying on a scale regulated by the average price of corn for seven years, for all the other forms of payment. This commutation may either be voluntary, or may be effected by the tithe commissioners, according to a valuation. Land not exceeding twenty acres may be given by a parish in commutation of tithes; but only in the case of ecclesiastical persons, and not of lay improvers. Similar arrangements have been made in those few Catholic countries in which tithes still continue to be paid.

In Ireland the settlement was effected by a general commutation of tithe into a money rent charge, regulated by a valuation of the tithes (one-fourth being deducted

for the cost of collection), and payable by the proprietors, who should receive it from the occupiers of the land. By the Irish church act (32 and 33 Vict. c. 42), this rent-charge became vested in the commissioners of church temporalities, with power to sell such rent-charge to the owner of the land charged therewith at 22½ years' purchase. In 1890-91 a general agitation for the abolition of tithes was begun in Wales, and in many districts the collection of tithes was resisted by force. No final action, however, was taken by parliament although the liberal party endeavored to secure a commutation of the tax.

TITHING, an ancient Saxon division of the country, consisting of the tenth part of a hundred, being occupied by ten families, each of whom was responsible for the good behavior and peace of the rest. The institution has been long growing obsolete, and the police constables (q.v.) now supersede the officer called a tithing-man.

TITHO NUS, son of Laomedon, brother of Priam, and spouse of Eos, the goddess of morn. The story is that Eos, in asking immortality for her spouse, forgot to ask at the same time eternal youth, so that in his old age he became completely shrunk and decrepit, whereby his "cruel immortality" was rendered a burden to him.

TITIAN, or **TIZIANO VECELLI**, the head of the Venetian school, and one of the greatest painters that ever lived, was b. of a good family at Capo del Cadore, in the Friulian Alps, in the year 1477, or, according to some, in 1480. His predilection for drawing caused his father to send him to Venice at the age of ten, that he might learn to be a painter. His instructors were Sebastiano Zuccati and the two Bellini, particularly Giovanni; but the painter that exercised the greatest influence on his style was Giorgione (q.v.). So vivid and keen was his appreciation of the distinctive features of any artist's work, that he never failed to reproduce them with striking fidelity, and even to leave the impression that he had beaten the master whom he imitated, in his own style. It was owing to this irrepressible superiority that the friendship between Giorgione and him was interrupted. The first work that brought Titian prominently into notice was his completion of the "Homage of Frederick Barbarossa to Pope Alexander III." (1512), begun by Giovanni Bellini, but left unfinished by that artist at his death. The Venetian senate, who had commissioned the piece, were so much pleased with Titian's performance, that they conferred on him an office with an annual salary of 300 crowns. In 1514 he painted a "Bacchus and Ariadne," and other works of a similar kind, for the duke of Ferrara, a portrait of the duke himself, and of the lady who afterward became his wife, besides a picture of the "Tribute-money." While residing at the court of Ferrara, he made the acquaintance of the poet Ariosto, who sat to him for his portrait. On his return to Venice he painted an "Assumption of the Virgin," one of his grandest achievements. His reputation now rapidly rose. Pope Leo X. and Raphael both invited him to Rome, and Francis I. to France; but he declined. During 1520-30 the most celebrated of his numerous productions were—"St. Peter, Martyr," a work of unsurpassable beauty; "Victory of the Venetians over the Janizaries;" and "St. Sebastian." In 1530 his friend Ariosto (q.v.), the poet, introduced him to the notice of the emperor Charles V., whose portrait he painted at Bologna, and who gave him several other commissions. From Bologna Titian proceeded to Mantua, where he executed a great number of works for duke Frederico Gonzaga. In 1532 he appears to have accompanied Charles to Spain, where he remained for three years, and painted several of his masterpieces, now found in that country. In 1537 he executed an "Annunciation;" in 1541 a "Descent of the Holy Ghost upon the Apostles," a "Sacrifice of Abraham," "David and Goliath," and a "Death of Abel;" and in 1543 pictures of the "Virgin," and "San Tiziano," and portraits of pope Paul III., cardinal Farnese, and duke Octavio Farnese, at Rome, where he remained three years. The emperor Charles V., who greatly admired his genius, twice called him to Augsburg (1547 and 1550). Among the religious works which he executed for Philip II. of Spain are a "Last Supper," "Christ in the Garden," "St. Margaret with the Dragon," and a "Martyrdom of San Lorenzo;" besides these we notice a "Venus and Adonis," a "Danaë," a "Medea and Jason," and other classic subjects. A complete catalogue of Titian's works does not exist, but the number known is extraordinarily great—upward of 600. Titian died of the plague in 1576, having attained the extreme age of 99. He is best studied at Venice or Madrid, but splendid specimens of his work are to be seen in the chief European galleries. As already observed, he had at first a tendency to reproduce the style of acknowledged masters, but his genius soon emancipated itself from all imitativeness, and displayed a glorious originality and power. The luxury of light did never so enrich a painter's canvas. This is, indeed, his transcendent excellence. Not inaccurate in design, not sterile in invention, not infelicitous in composition—these, his minor merits, are nevertheless wholly thrown into the shade by the splendor, boldness, and truth of his coloring, which alone has sufficed to give him a place alongside the greatest names in art, Raphael, Leonardo da Vinci, and Michael Angelo.—See Hume's *Notices of the Life and Works of Titian* (Lond. 1829); Northcote's *Life of Titian* (Lond. 1830); *Titian, his Life and Times*, by Crowe and Cavalcaselle (Lond. 1876); and Lafenestre, *La Vie et l'Œuvre du Titien* (1886).

TITICA CA, LAKE. See **PERU**.

TITIENS, THERESA. See **TIETJENS**.

TITLARK AND TITLING. See **PIPIT**.

TITLE, REGISTRATION OF, in England, is a modern experiment, set on foot after long-continued opposition, and still frowned on by the solicitors, who conceive that its operation will be to reduce their emoluments. Owing to the total want which had always existed of a register for deeds or writs connected with the transfer of land, except in the counties of Middlesex and York, the complexity and uncertainty attending the operations of conveyancing had long been the opprobrium of English law, and the mercantile classes at last called for a remedy by which an acre of land might be sold with the same expedition and certainty as bank stock. Under the system referred to, so far from expedition being a feature of conveyancing, delay, expense, and insecurity were the chief characteristics. It was till 1874 the inveterate practice for a purchaser of land to demand, and for the vendor to give, what is called a sixty years' title—i.e., he must show the successive owners for sixty, and since 1874 for forty years previous to the sale, and all that these owners did in connection with it. This created great expense and delay. But if the property were sold next month, or next day, precisely the same process had to be repeated between the new purchaser and his vendor, for what might have been done between other parties previously was not binding, nor was it safely to be acted on by their successors in the property. These evils called loudly for some remedy, and of late years all the legal reformers have been busy with projects to provide some relief. An important impetus was given to reform by the passing of the Irish incumbered estates act in 1848, the object of which was to break up and compel a sale of the deeply incumbered estates of Ireland. In 1854 a similar statute was applied to the estates of the West India islands. In 1862 two acts passed for establishing in England a land registry, 25 and 26 Vict. 53, 67, for registering indefeasible titles, but they were confined to good marketable titles. Land of the value of about £6,000,000 had been registered under those acts of 1862, when a more elaborate scheme was prepared by the land transfer act, 1875, 38 and 39 Vict. 87, which greatly amplified and matured the previous efforts in the same direction. The office of land registry is conducted by a registrar, appointed by the lord chancellor, who must be a barrister of ten years' standing. He has assistants and clerks. The office has a seal and various forms to be used in connection with the business. The fees are all fixed by the lord chancellor and the treasury, and these are paid by means of stamps. Power is also given by the act to create hereafter district registries. And it is provided that any land situated in Middlesex and Yorkshire, two counties which already had land registries, should, if registered under the new act, be exempt from the jurisdiction under the local acts, it being contemplated that the general law now established will gradually supersede the former local machinery.

Under the land transfer act, 1875, any person who has contracted to buy freehold land, or any owner or any person having power to sell it, may apply to the registrar to be registered, with an absolute title or with a possessory title only. In case of a purchaser applying the vendor must consent. The registrar must approve of the title submitted, and in case of a sale the vendor and his solicitor must make an affidavit that they have produced all the deeds, wills, instruments of title, and all charges and incumbrances affecting the title, as well as all facts material. The registrar can also compel third parties to produce deeds relating to the land. If doubtful questions as to law or fact arise in reference to it, the registrar may refer a case for the opinion of the high court of justice; and that opinion will be conclusive, because all parties having any possible interest are fully heard by the court. The freehold absolute title will show all incumbrances on such land, and other rights which the act declares not to be incumbrances. The possessory title does not prejudice the enforcement of adverse rights which exist at the time of registration, but in other respects it has the same effect as the absolute title. Leasehold lands may also be registered, and they are registered in a separate register. When once the title is registered no adverse title will acquire any advantage by length of possession. The registered proprietor can by a simple form charge or burden the land with a payment of a sum of money at an appointed time. When the registered land is sold the transferee's name is entered on the register, and a land certificate given to him. Any person claiming on adverse interest may lodge a caution having the effect of entitling him to notice of all future dealings with the property if registered, or he may lodge a like caution against the land being registered at all. No notice of a trust is to be entered on the register, and a trustee selling land may authorize the purchaser to be registered as the first proprietor. The land transfer act is not compulsory, but it was expected that it would gradually become generally accepted when the simplicity it secured for titles came to be better known.

The registration of title in American law, confined usually to real estate, has been defined as "the means whereby the owner of a real estate in real property acquires his right of property, his right of possession, and his actual possession." The title may be by descent or by purchase, the latter term being used to include all methods of acquisition except that by descent. Title by purchase may be by grant or by devise, by operation of the law, or by act of the parties. The various modes by which title may be acquired by act of law are described under the topics ABANDONMENT, ESCHEAT, FORFEITURE, PRESCRIPTION, MARRIAGE, EXECUTION, and EMINENT DOMAIN. Grants may be private or public; the former are by deeds, for consideration *valuable*, as money; or *good*, as

affection, and the deed must be signed, sealed, and delivered; in many states the signature must be attested and acknowledged before a magistrate. As to registration, see RECORD OF CONVEYANCES. Title by public grant in this country is that acquired in real property previously belonging to the government of the United States or one of the states. The fee simple of all unsold lands is in either the general government or the states, and is parted with by an instrument called a patent, the terms of which (unless there has passed some consideration), are construed in favor of the government as against the patentee.

TITLE-DEEDS are the evidences of ownership of real property in this country. Each owner is supposed to be in possession of his own, either by himself or his solicitors; and the ownership of the title-deeds passes along with that of the lands themselves. In England there is no general register, except in Middlesex and Yorkshire, and elsewhere to the extent allowed under the land transfer act. It is a dangerous thing to part with title-deeds, for, by merely pledging them as a security for money a mortgage may be created over the lands. In Scotland there is a general register where all title-deeds may be kept, or authentic copies, so that the loss of one may be replaced without much difficulty.

TITLES OF HONOR, designations to which certain persons are legally entitled, in consequence of possessing particular dignities or offices. King and emperor are titles of honor belonging to the sovereigns of different countries; and your majesty is the form of address to which, by the usage of most European countries, they are entitled. Your grace was in England, in former times, the usual mode of addressing the sovereign. The epithet majesty, taken from the *majestas* of the emperors of Rome, was adopted by the emperors of Germany, who considered themselves their successors; but its use by other European sovereigns is of comparatively recent date. Henry VIII. was the first king of England, and Henry II. the first king of France, who adopted it. Your highness is the style adopted by the sultan of Turkey. The proper style of the reigning sovereign of the United Kingdom is, "Victoria, by the grace of God, of the United Kingdom of Great Britain and Ireland, queen, defender of the faith." The sons of the sovereigns of England are styled princes, and their daughters princesses; and the sovereign's eldest son is prince of Wales (q.v.). The title of royal highness is given to all the children of the sovereign, and by letters-patent under the great seal in February, 1864, her majesty declared her pleasure that the children of the sons of the sovereign should also enjoy the same title. The different grades of the peerage have their several titles—duke, marquis, earl, viscount, and baron—each of which was in its origin a name of office involving certain specific duties. See FORMS OF ADDRESS, COURTESY TITLES.

Though most European countries have their dukes, marquises, counts, viscounts, and barons, these often differ considerably in rank from the seemingly corresponding titles in Britain, and the English rules and practices regarding title are not applicable abroad. The complicated system of titles by law, and still more by courtesy, which prevails in England, is a source of endless perplexity to such foreigners as endeavor to make themselves acquainted with it.

TITMOUSE. See TIT; CHICKADEE.

TITULAR one who enjoys the bare title of an office, without the actual possession of that office. Thus, the English kings styled themselves kings of France from the time of Henry IV. down to the year 1800; and previous to the recent changes in Italy, the king of Sardinia, as well as the king of Naples, was titular king of Jerusalem. In English ecclesiastical law a titular is a person invested with a title, in virtue of which he holds a benefice, whether he performs its duties or not. In the law of Scotland the term has received another acceptation. When the king, at the reformation, became the proprietor of all church lands, he erected the monasteries and priories into temporal lordships, and bestowed them on laymen, who were known as lords of erection, or titulars; this latter name indicating that they had the same title as had formerly been possessed by the religious houses to the lands and tithes.

There are many titular dignities in the Roman Catholic church; but the class of them which is chiefly noticeable is that which has grown out of the separation between the eastern and western churches. It is well known that the Roman pontiff, notwithstanding the schism, claims to retain authority over the entire extent of Christendom; and even where there is not any longer resident within the limits of an ancient church or province a body of Christians of the Roman communion, the pope claims to appoint an ecclesiastic to be bishop, metropolitan, primate, or patriarch of the ancient see (see IX PARTIBUS INFIDELIUM). In England, and still more in Ireland, where archbishops and bishops of the Roman Catholic church exist *de facto*, but not *de jure*, they are styled titular.

TITUS, a co. in n.e. Texas; drained by the Sulphur fork of the Red river; and by White Oak and Cypress bayous; 400 sq.m.; pop. '90, 8190, incl. colored. The surface is level. The soil is fertile. The principal productions are corn, cattle, cotton, and potatoes. Co. seat, Mount Pleasant.

TITUS, a companion of Paul in the embassy from Antioch to Jerusalem and in his next missionary journey to Asia Minor and Macedonia; was twice sent as a confidential

messenger to the church of Corinth. Having been associated with the apostle in preaching the gospel in Crete, he remained some time there having charge of the churches. Afterward they met at Nicopolis, a city of Epirus, and Titus having then been sent into Dalmatia, does not again appear in Scripture. Nothing more concerning him is certainly known.

TITUS, EPISTLE to, one of the three "pastoral epistles," was written by St. Paul, probably in the latter part of his life, and after he had been liberated from his first imprisonment at Rome. From the 12th verse of chapter iii., we learn that the apostle was staying at Nicopolis when he wrote the letter, and the subscription identifies this place with Nicopolis of Macedonia; but this is impossible, for, as De Wette notices, that city appears to have been founded by the emperor Trajan long after St. Paul was dead. Jerome's opinion is probably the correct one, that the Nicopolis referred to was the famous city in Epirus. The epistle concerns itself mainly with the organization and discipline of the church in Crete, is very practical, and at times unpleasantly sharp in its tone, as if Paul had felt more acutely than usual the vexations which "unruly and vain talkers and deceivers, *specially they of the circumcision*," caused him. Above all things, however, he is nobly solicitous that the Christians of Crete should prove the sanctifying power of their new faith by rising superior to the immoral practices of heathenism. The natural character of the people was unsteady and quarrelsome. They were greedy, licentious, false, and given to strong drink; and the Jews who had settled among them were even worse than the natives. Among such a people Titus was left to carry on the work of establishing Christianity. Hence Paul addressed this epistle to him, adopting in it a sharpness of style which critics consider unusual. First he enlarges on the qualifications of church officers, and on the vices from which they must be free. He then describes the virtues which should adorn old persons, women, the young, servants, and Christians generally. In the third place he commands obedience to civil rulers; commands moderation and gentleness; and condemns all idle and vain speculations. He finally urges Titus to join him at Nicopolis and adds loving salutations and benedictions. See the Commentaries of Chrysostom, Jerome, Aquinas, Luther, Melancthon, Calvin, Cocceius, Grotius, Rosenmüller, De Wette, Alford, Wordsworth, Ellicott, etc.

TITUS FLAVIUS SABINUS VESPASIANUS, Emperor of Rome, was the eldest son of Vespasianus (q.v.) and Flavia Domitilla, and was born at Rome, Dec. 30, 40 A.D. Brought up at the court of Nero along with Britannicus, the son of the emperor Claudius, he received an excellent training both of body and mind, became an adept in manly exercises, and an accomplished scholar; and subsequently, as *tribunus militum* in Germany and Britain, and commander of a legion in Judæa under his father, proved his qualities as a soldier and a general. On his father's elevation to the imperial throne, Titus was left to prosecute the Jewish war, which he brought to a close by the capture of Jerusalem after a long siege. The news of the success was received with the utmost joy, and Vespasian's too suspicious temper was awakened. However, Titus by returning to Rome, and laying the trophies of victory at the emperor's feet, removed his unfounded jealousy, and father and son obtained the honor of a joint triumph (71 A.D.). About this time Titus became his father's colleague in the empire, and the impression which the conduct of the young conqueror made upon the Roman people was, and with just reason, very unfavorable. He gave himself up to the pursuit of pleasure in all its forms, put to death various suspected persons very summarily, and even caused one of his guests, whom he justly suspected of conspiracy, to be assassinated as he left the palace. His *liaison* with Berenice, the daughter of Herod Agrippa I. (q.v.), was also very distasteful to the Romans; and on the death of his father (79 A.D.), whom he was at that time believed by a few to have poisoned, the Romans had satisfied themselves as to the advent of a second Nero. But Titus's behavior after his hand grasped an undivided scepter completely belied their anticipations. The very first act of his reign was to put a stop to all prosecutions for *læsa majestas*, which had abounded since the time of Tiberius (q.v.); informers were scourged in the forum, dragged along in front of the theaters, and then either sold as slaves or banished. The ancient and venerated buildings of Rome were repaired; new ones, as the Colosseum (see AMPHITHEATER) and the baths which bear his name, were erected; and the prominent tastes of the populace were abundantly gratified by games on the most stupendous scale, which lasted for 100 days. Titus's beneficence was unbounded, and it so happened that during his brief reign there was the most urgent need of its exercise. In 79 A.D. occurred the eruption of Vesuvius which overwhelmed Herculaneum and Pompeii and ruined numerous other towns and villages; in 80 A.D. a fire broke out in Rome, which raged for three days, destroying the capitol, Augustus's library, Pompey's theater, and numerous houses; and in the tracks of these calamities followed a dreadful pestilence. Titus dealt out gifts with lavish hand to the houseless and ruined sufferers; he even despoiled his palaces of their valuable ornaments, to obtain money for distribution, and schemed and planned to furnish occupation for them. He was now the idol of his subjects, the "love and delight of the human race;" but, unfortunately for that part of the human race over which he ruled, in the commencement of the third year of his reign he became suddenly ill, and

died at his patrimonial villa in the Sabine country (Sept. 13, 81, not without the suspicion that he had been poisoned by Domitian, his younger brother.

TITUSVILLE, a city in Crawford co., Pa.; on Oil creek, and the Western New York and Pennsylvania and the Dunkirk, Allegheny Valley, and Pittsburg railroads; 28 miles e. of Meadville, the co. seat. It has a high school, public library, electric lights, water-works owned by the city and supplied from cisterns and wells, churches, national and state banks, public parks, and three handsome bridges across the creek. The manufactures include boilers, engines, oil well drilling tools, iron forgings, steel, leather, chairs and furniture, silk goods, soap, radiators, etc. The first petroleum well in America was drilled in the suburbs of Titusville in 1859, and since then the city has been one of the most important oil centers in the country, and its principal industries are those connected with the petroleum trade. Pop. '90, 8073.

TIUMEN', a t. of West Siberia, in the government of Tobolsk, stands on the Toura, an affluent of the Ob (q.v.). Its advantageous situation on the highways, both by land and water, which communicate between Russia and Siberia, has made it an important commercial center, and the seat of flourishing manufactures. The vessels which navigate the Ob, the Irtysh, the Tobol, and the Toura, for the most part receive their cargoes here. Large quantities of leather, wooden articles, carpets, soap, candles, and common pottery are manufactured and exported through West Siberia, the Ural countries, the Kirghis steppes, Khokan, Bokhara, and China. Pop. '91, 36,763.

TIVERTON, a municipal and parliamentary borough and market town in the N.e. of Devonshire, 14 m. n. of Exeter. There are important weekly markets, and great markets for cattle annually. There is a large lace-factory, in which upward of 1800 hands are employed. The town was formerly a great center of the woolen trade. The town is built on a hill between the rivers Exe and Lowman; hence the old names of the town, TWYFORD and TWOFORDTOWN. There is a peculiarity about the town in the rapid streams of water flowing down the channels along the sides of the streets. These streams of water were given to the town about the year 1272, by Isabella Rivers, countess of Devon. The castle was built in 1106. The free grammar-school, an old building in the Elizabethan style, was endowed by Mr. Peter Blundell in 1604. Other buildings were added in 1800, at a cost of \$20,000. There are other schools and numerous charities. Tiverton sends two members to the house of commons. Pop. '81, 10,462; '91, 10,892.

TIVOLI (anc. *Tibur*), a poor t. of central Italy, province of Rome, 19 m. e.n.e. from Rome, stands on the slope of Monte Ripoli, one of the Apennines. Tivoli is walled, and has a fortress. The streets are steep, narrow, and beset by beggars. There is a fine cathedral, formerly a temple of Hercules, where Augustus held his tribunal. The surrounding hills are covered with olive trees. The vines of Tivoli are famed for a peculiar sort of grape, in great request for its firmness and luscious flavor, noticed as early as the time of Pliny the Elder. The stone called "travertino," of which great part of Rome is built comes from Tivoli. Pop. '81, 10,927. Near Tivoli is the extensive villa d'Este. Within and without the city there are many monuments of antiquity. In a commanding position above the falls of the Anio rises the temple of Vesta, of a circular form, and in good preservation, built 70 B.C.; there are the extensive remains of the emperor Hadrian's magnificent villa; the villa of Mæcenæ; remains of mausoleums, aqueducts, bath, etc. The place is much visited by tourists for its waterfalls, which are lofty, but not very picturesque. The Anio furnishes excellent water-power, which since 1892 has been utilized for electric lighting both at Tivoli and at Rome, and for iron-works at the former town.

Tibur long existed as a town (according to ancient tradition) before the building of Rome; but the first mention of it in recorded history occurs 446 B.C., during the Roman decemvirate. It was one of the principal towns of the Latin confederation. Its healthy and picturesque situation induced many of the wealthy Romans to choose it for their country residences. Mæcenæ, Scipio, Æmilianus, the famous Marius, Metellus Numidicus, and Munatius Plancus, had their Tiburtine villas. Horace preferred Tibur to all other places of resort (although he makes allusion to its moist atmosphere, calling it "Udum Tibur"), and had a country-house in the neighborhood. It is one of the few towns of Latium which still stand on their ancient sites.

TILAXCALA, or TLASCALA, a city and state of Mexico, the state being bounded on three sides by Puebla, and w. by Mexico; drained by the Mescala, crossed by the Malinche mountain, and traversed by the Mexico and Vera Cruz railroad, completed in 1872; 1595 sq.m.; pop. '95, 166,803. The city and capital is situated on the Mescala, between two mountains, 20 m. n. of Puebla; pop. abt. 8000. The surface of the state is mountainous, and the soil fertile, producing large quantities of maize, also the maguey or pulque plant, and in some parts hemp has been successfully cultivated. There are manufactures of cotton and woolen cloths. The Tlaxcalans were a warlike and powerful race, remaining unconquered till 1519, when Cortes defeated them, and they became subject to Spain, not, however, renouncing their religion. They are intelligent and of Indian descent.

TLEMCEŃ, a t. of Algeria, in the province of Oran, and 80 m. s.w. of the city of that name, stands in an undulating country, everywhere irrigated, and brought completely under cultivation. It contains Catholic and Protestant churches, mosques, and synagogues, and there are numerous educational institutions, including schools for Arabs and Jews. It is protected from the s. wind by a range of hills, 4200 ft. in height. The town is accessible only from the s.w., the other sides presenting steeply escarped fronts. The district around Tlemcen is covered with fruit-trees of all kinds, of which the olive is one of the most valuable, and there is much cultivated land, producing cereals, tobacco, etc. Besides the special markets, a daily market is held, at which cattle, wool, grain, and oils are largely sold. Ostrich feathers and corks are exported; but the trade is for the most part in cloths, hides, grain, and oils. Pop. '91, 19,802.

TOAD, *Bufo*, a genus of *batrachia*, of the *anourous* or tailless section of the *caducibranchiata*. See **BATRACHIA**. The original genus has been subdivided, and is now constituted into a family, *bufonidae*, to all which the popular name toad is often extended. The form resembles that of the frogs, but is more thick and clumsy, and the hind-legs are generally short, so that the species rather crawl than leap; some of them, indeed, are not known to leap at all. The skin is warty, and the warts or tubercles produce a milky exudation, which in some species is very fetid. Behind the ear there is a porous pad—a very large parotid gland—from which a copious exudation takes place. The muzzle in the restricted genus *bufo* is rounded, but some of the family have an elongated muzzle. The mouth of the true toads is destitute of teeth. The food of toads consists chiefly of small insects and slugs, and they mostly inhabit shady places, avoiding the sunshine, and crawling about either among the stems and leaves of plants or among stones. In their adult state they are much less aquatic than frogs, but their spawn is deposited in water, in which their tadpoles live like those of frogs. They are commonly regarded with disgust, on account of their appearance, the exudation from the skin, and the smell of many of them, yet the eye of the toad is remarkable beautiful. A notion has very generally prevailed that the exudation of the skin is venomous, but it is unsupported by evidence, and toads are handled with perfect impunity. They are eaten by some savage tribes.—Only two species are British. The **COMMON TOAD** (*B. vulgaris*) is abundant in most parts of Britain, and in the western parts of Europe, but is not found in Ireland. A description of it is unnecessary. It spends the winter in a dormant state, and issues from its retreat on the return of spring. Its spawn is deposited in March or April, and much resembles that of the frog, but the ova are smaller and more numerous. The young toad is very small when it loses its tail and gills, and exchanges the tadpole for the adult form. Toads are very useful in gardens, in preventing the excessive increase of some kinds of insects; and on this account it is a frequent practice to put them into hot-bed frames, for which use the market gardeners of the neighborhood of London often purchase them at the price of fourpence each. They have occasionally been tamed, and display some intelligence, readily recognizing those who feed them and are kind to them. A tame toad, of which an account is given by Pennant in his *British Zoology*, lived for more than 40 years, and was at last killed by a raven.

Numerous instances are on record in which toads are said to have been found embedded in rocks, walls, and even in the trunks of trees, where the necessary conclusion is that they must have lived a very long time, in a dormant state. Unfortunately, however, the discovery of these toads has almost always been made by unscientific persons, and there is a want of proper and trustworthy observations as to the places in which they have been found. Attempts have been made by several naturalists, and among others by the late Dr. Buckland, to throw light on the subject by experiment, immuring toads in various ways, and the result, although showing that when air is not wholly excluded they are capable of living for a long time in their imprisonment, probably in a dormant state, is not favorable to the belief that such existence could extend over many years. An interesting account of Dr. Buckland's experiments will be found in Mr. F. Buckland's *Curiosities of Natural History*.

The other British species of toad is the **NATTERJACK** (*B. calamita*) which was first described as British by Pennant, and has since been found to be pretty abundant in some parts of England, and in the s.w. of Ireland, chiefly in the vicinity of the sea. It much resembles the common toad, but is of a yellowish-brown color, clouded with dull olive, a bright yellow line passing along the middle of the back. It has a disgusting smell. It never hops, and its motion is more like walking or running than the crawling of the common toad.—Several other species of toad are found in Europe. Some of those found in tropical countries attain a very large size. The **OBSTETRICIAN TOAD** (*B. obstetricans*), after the female has extruded her eggs, places them about his thighs and carries them, it is said, till the eyes of the embryo become visible. See illus., **REPTILES**, ETC., vol. XII.,

TOAD-FISH. See **FROG-FISH**.

TOADFLAX, *Linaria*, a genus of plants of the natural order *scrophularineæ*, very closely allied to **SNAPDRAGON** (q.v.), from which genus this has but recently been separated, and is distinguished chiefly by the spur at the base of the corolla, and the capsule opening by valves or teeth, not by pores.—The species are herbaceous plants, natives chiefly of the colder and temperate parts of the old world. Some of them are

natives of Britain, of which the most common is *L. vulgaris*, a species with erect stem 1 to 3 ft. high, glaucous, linear-lanceolate leaves which thickly cover the stem, and terminal spikes of yellow flowers. It grows in hedges, the borders of cornfields, etc. It possesses purgative and diuretic properties, and a decoction of it is used as a fly-poison; but it is regarded as a troublesome weed by farmers. It has found its way, probably along with grain or other grass seeds, into the United States. A very remarkable monstrosity is sometimes seen in this plant, to which the name *peloria* has been given, the flower presenting five spurs, and five usually imperfect stamens.

TOADSTOOL. A popular name for any poisonous variety of mushroom (q.v.).

TOADSTONE, a local Derbyshire name for a soft and earthy variety of trap, looking like an argillaceous deposit.

TOAST (Lat. *tostus*, scorched or roasted) is the name given to bread dried or scorched before the fire. So early as the 16th c. toasted bread formed a favorite addition to English drinks. Sack was drunk with toast, and so was punch. The practice of drinking healths, particularly that of an entertainer, is one so natural, so likely to spring up spontaneously, that it is impossible to say when it began. Certain it is, however, that it received an artificial development owing to the prevalence of convivial habits in the 17th century. Then it became the fashion to drink not to the health of entertainers only, but to that of each guest, of absent friends, and more especially of the unmarried woman whose attractions were most generally acknowledged. It also became the custom to describe a woman whose health was so drunk as herself "a toast." In this sense, the application of the word is said to have had its origin in an incident which occurred at Bath, and which is recorded in the 24th number of the *Rambler*, in the following passage: "It happened that on a public day, a celebrated beauty of these times" (when it was the fashion for ladies to bathe publicly in elegant dresses made for the purpose) "was in the Cross Bath, and one of the crowd of her admirers took a glass of the water in which the fair one stood, and drank her health to the company. There was in the place a gay fellow, half fuddled, who offered to jump in, and swore, though he liked not the liquor, he would have the toast" (making, of course, allusion to the custom of putting toast in punch). "He was opposed in his resolution; yet this whim gave foundation to the present honor which is done to the lady we mention in our liquor, who has ever since been called a toast." Whatever may be the origin of the use of the word "toast" in this sense, we now apply it not only to any person, but to any sentiment mentioned with honor before drinking. The French have adopted the word "toast" from us; making it masculine when applied to a man or a sentiment, but feminine when applied to a woman.—See Chambers's *Book of Days*.

TOBACCO (of uncertain derivation, but most probably from the native American name), a genus (*nicotiana*) of plants of the natural order *solanaceæ*, having large broad leaves; a five-parted calyx; a funnel-shaped, five-lobed corolla, and five stamens; the flowers growing in panicles at the top of the stem; the fruit a two-celled, five-valved, many-seeded capsule. The species are mostly herbaceous plants, rarely shrubby, with large broad leaves, and everywhere covered with clammy hairs. They are natives of warm countries, most of them American, although some are found in the East Indies. They all possess the narcotic property, on account of which a few of them are extensively cultivated. It resides in almost all parts of the plant, although the leaves are almost exclusively used. The most important species is the COMMON TOBACCO, or VIRGINIAN TOBACCO (*N. tabacum*), a native of the warm parts of America, the cultivation of which had extended, before the discovery of the new world by Columbus, far to the n. of the regions in which the plant appears to be indigenous. It is about 5 or 6 ft. high, erect, with lanceolate, sessile leaves, 6 to 18 in. long, and rose-colored flowers, the throat of the corolla inflated, the segments pointed. There are numerous varieties, differing more or less in the size and form of the leaves, and in the form and color of the flowers, some of which are regarded by some botanists as distinct species. One of these is the BROAD-LEAVED TOBACCO, or MARYLAND TOBACCO, which has a thicker stem, and much broader leaves. The GREEN TOBACCO (*N. rustica*), sometimes called ENGLISH TOBACCO, because it was the first kind introduced into England for cultivation, is a smaller plant, from 3 to 5 ft. high, with ovate, stalked leaves, and the segments of the corolla rounded, its tube cylindrical. It is a native of the east, but is more hardy than the Virginian tobacco, and is therefore cultivated in more northern regions. The PERSIAN TOBACCO (*N. Persica*) has the root-leaves oblong, those of the stem lanceolate and sessile; the corolla salver-shaped, with a long tube; its lobes rather unequal. It is a native of Persia, and furnishes the Shiraz tobacco, so much esteemed in the east, and which is milder than the common tobacco. Other species of tobacco are used in different parts of America, and some of them are cultivated to a small extent, as *N. repanda*, in Cuba; *N. quadrivalvis*, by the Indians on the Missouri; *N. multivalvis*, by the Indians on the Columbia; and *N. nana*, by the Indians of the Rocky mountains.

It is somewhat doubtful whether the use of tobacco as a narcotic was known in the east before the discovery of America. Meyen, in his *Geography of Plants*, expresses the opinion that the smoking of tobacco is of great antiquity among the Chinese, because on very old sculptures he has "observed the very same tobacco-pipes which are now in

use." Meyen's authority, however, is greater as a botanist than as an archæologist, and cannot be received as decisive of the antiquity of the sculptures of which he speaks. It is not improbable that the smoking of tobacco has been long practiced in China, but it is not certain. If it was so, the custom did not extend among neighboring nations, which, however, has been the case also as to the use of some other narcotics; whereas, on the introduction of the use of tobacco from America, it rapidly extended throughout Europe, and soon became extremely prevalent among oriental nations. In the present state of our knowledge, no ethnological argument can be founded upon the prevalence of smoking among the Mongolians and the American Indians. The smoking of tobacco was found by Columbus to be practiced in the West Indies, where the natives made it into cylindrical rolls, wrapped in maize-leaf. It has been prevalent from unknown antiquity among the American Indians as far north as Canada. With them it even has a religious character, and is connected with their worship and with all their important transactions. Thus the calumet (q.v.), or pipe of peace, is indispensable to the ratification of a treaty; and smoking together has even greater significance of friendship than eating together has among other nations. "In the belief of the ancient worshippers, the Great Spirit smelled a sweet savor as the smoke of the sacred plant ascended to the heavens; and the homely implement of modern luxury was in their hands a sacred censer, from which the hallowed vapor rose with as fitting propitiatory odors as that which perfumes the awful precincts of the cathedral altar, amid the mysteries of the church's high and holy days."—Wilson's *Prehistoric Man*, i. 383. The seeds of the tobacco plant were first brought to Europe by Gonzalo Hernandez de Oviedo, who introduced it into Spain, where it was first cultivated as an ornamental plant, till Nicolo Manardes extolled it as possessed of medicinal virtues. It was introduced into Italy in 1560. The use of tobacco in the form of snuff soon followed its introduction for smoking. There is no reference to the use of tobacco in Shakespeare, yet it is certain from other evidence that it was well known in England in his time, although at first its use was confined to the wealthy, as the price was very high and it was smoked in very small pipes—probably the same which are known to antiquaries as *elfin pipes*—and the smoke was expelled, not from the mouth, but by the nostrils, in which way the narcotic power of the herb is much greater. Tobacco was at first recommended for medicinal virtues, which were greatly exaggerated, but soon became an article of luxury. The popes Urban VIII. and Innocent XI. fulminated against it the thunders of the church; the priests and sultans of Turkey declared smoking a crime, Sultan Amuret IV. decreeing its punishment by the most cruel kinds of death; the pipes of smokers were thrust through their noses in Turkey; and in Russia the noses of smokers were cut off in the earlier part of the 17th century. King James I. of England issued a *Counterblaste to Tobacco*, in which he described its use as "a custom loathsome to the eye, hateful to the nose, harmful to the brain, dangerous to the lungs, and in the black, stinking fumes thereof nearest resembling the horrible Stygian smoke of the pit that is bottomless." All opposition, however, was in vain. The use of tobacco increased and has continued to increase to the present day, when it is more prevalent than at any former time, the luxury of rich and poor, of civilized nations and of savage tribes. Although it did not become prevalent in the east till the 17th c., the Turks and Persians are now the greatest smokers in the world. In India, all classes and both sexes smoke; in China, the practice—perhaps there more ancient—is universal, and girls, from the age of eight or nine, wear, as an appendage to their dress, a small silken pocket to hold tobacco and a pipe. How the practice of smoking has increased everywhere, every one knows. The use of snuff has not increased in the same manner, but has rather diminished. Tobacco is used in the three modes of smoking, chewing, and snuffing.

Tobacco derives its botanical name (*Nicotiana*) from Jean Nicot, who introduced it into France. In that country, its use in the form of snuff began in the reign of Francis II. About the same time, a snuff-manufactory was established at Seville, which produced the celebrated Spanish snuff. The tobacco plant was soon after introduced into other countries of Europe. In 1657, the manufacture and sale of tobacco were farmed out in Venice, and began to yield a considerable revenue. Much revenue has since been derived from the same source, in many countries. Tobacco is now extensively cultivated in many parts of Europe, as well as in Asia and America. Prohibitory laws alone prevent its cultivation in the southern parts of Britain and Ireland, of which the climate is quite suitable to it. The quality of the leaf, however, deteriorates in the more northern regions in which it is cultivated, as in Germany, when it is continuously raised from home-grown seed, and seed is therefore imported from warmer countries.

Cultivation and Commerce.—The cultivation of tobacco requires a rich, loose soil, and the strongest manures are advantageous. The influence of soil, climate, and manures on the quality of the produce is very great, almost beyond what is known in any other cultivated plant. Vegetable manures are best for tobacco intended for smoking; animal manures are preferred for that which is to be made into snuff. In the more northern regions in which tobacco is cultivated, the seed is sown in a hot-bed, protected from frost by mats, and the plants are planted out in rows from two feet to three feet apart in the field. The ground is frequently hoed and stirred. Where the plants are not intended for seed, the top is usually broken off, so as to prevent flowering, that its whole strength may be directed to the leaves. In America, when the leaves begin to become yellow, or are marked with yellow blotches, the plants are cut down, and hung up in a

large barn to dry, but in Germany, the leaves are gathered as they become yellow, are tied in small bunches, and are hung up in a shady place to dry.

The cultivation of tobacco is comparatively easy, and, although a warm climate suits it best, it is without much difficulty raised in most parts of Europe. The usual plan in the great tobacco-producing countries is to sow the seed in seed-beds of rich soil, and, as the seed is extremely minute, it is first mixed largely with sand or wood-ashes, to assist in spreading it thinly. In Virginia, which may be taken as one of the best tobacco-growing districts, this is usually done in the first week in January. After the seed-beds have been carefully prepared and sown, small branches of trees are laid over, to protect the seed, when it germinates, from the effects of frost; but these are removed as soon as can be done with safety, and the plants then grow rapidly, and are ready for transplanting into the fields about the beginning of June. The land in the fields is very carefully prepared, and small hillocks are raised up in rows; each is about a foot in diameter, and flattened at the top. With the first appearance of rain, the plants are carefully raised from the seed-beds, and carried usually by children, who deposit one on each hillock, on which it is carefully planted by experienced men, who follow after the children. Only wet weather will do for planting, so that this operation often lasts until the end of July. When planted, the tobacco crop requires much careful attention to weeding, and a watchful eye to prevent the ravages of various insect enemies. Much of this latter work is done by flocks of turkeys, kept on purpose by the planters. As soon as the plants begin to throw up the flower-shoot it is nipped off; otherwise it would weaken the leaves; but this process is neglected in some countries, especially in Turkey and Greece, where small leaves are preferred, and where, in some cases, as in the celebrated Latakia tobacco, both leaves, buds, and flowers are used. The time generally chosen for cutting it is mid-day, or when the sun is powerful, and the morning and evening dews absent. The cutting is done by hand, and only such plants are chosen as are ready, which is known by a clammy exudation which forms over the leaf, often giving it a spotted appearance. If the plants are very large, the stalk is often split down, to facilitate the drying. They are then removed from the field to the tobacco-house, around which are erected light scaffolds, to which the plants are suspended, generally by passing a thin stick through a split in the stalk of each, and so placing a number of plants on each stick, just near enough to prevent them touching each other. After some time hanging in the open air, the plants on the sticks are removed, and suspended in a similar way inside the curing-house, until the drying is completed. The leaves are next removed from the stalks, and all bad ones rejected. The chosen ones are tied up in bundles called hands, and these are packed in hogsheads, enormous pressure being applied in the packing. These hogsheads are very large casks, which must not contain less than 950 lbs. net in the United States, where the government exercises a very strict surveillance over the weight and quality of all tobacco grown and cured there. Previously to the late disastrous war with Brazil, a large tobacco-export had been carried on by Paraguay. The quality, though not equal to that grown in the United States, was, however, fair, and had been improving. Turkey has also, for several years past, been steadily increasing her exports of tobacco to other countries. The quality of Turkish tobacco is very peculiar: it is small in the leaf, and of a light color—either a bright yellow, a yellowish green, or a yellowish brown. Being extremely mild, it is a favorite with many smokers.

Tobacco, owing to the high rate of duty when in any manufactured form, is mostly imported in the leaf; but small quantities are brought in, chiefly for re-export, in various states of manufacture. The chief of these is called cavendish, which is made by stripping the blades of the leaves from the midribs, and, after sprinkling them with an infusion of tobacco made from the stalks and other waste parts, laying them in heaps to heat or ferment. This darkens their color; and while still moist and flaccid, they are laid smoothly upon each other, so as to form cakes about 9 in. in length by 3 in breadth, which are pressed by powerful machinery until they are very compact and hard. Another kind is called negrohead, which is formed into sticks about an inch thick, and 8 or 9 in length, which are laid across each other equally, and are then pressed into cakes. When the sticks are pulled apart, the rounded depressions caused by pressing them into one another gives them a slight resemblance to the wavy locks of a negro's hair, whence they receive their name.

Cigars and *cheroots* are also forms of manufactured tobacco; but so much in favor are these with smokers, that the exorbitant duty is very little check upon their importation. The island of Cuba supplies not only the best but also the largest quantity; the Havana tobacco being exceedingly well cultivated and cared for.

The best cigars known to the experienced smoker are those that are made from the tobacco grown in the Cuban district of Vuelta Abajo and hence known as Vuelta tobacco. Next comes that known as the Partido, of which nearly 70 per cent. of the Cuban cigars imported into the United States are manufactured. The Partido cigar regularly retails at from 25 to 30 cents.

The greater proportion of genuine Havana cigars now smoked in this country are not manufactured in Cuba, but at Key West (Tampa), by Cuban workmen from genuine imported tobacco, under the system used in Cuba and known to the trade as "Cuban hand-work." This term characterizes a very careful method, by which each piece of leaf is so graded that the entire cigar is of the same color throughout, with each vein of the leaf running in the same direction, in order to insure even and perfect burning.

The whole cigar is thus necessarily made by hand; and for work of this description very high wages are paid, often as much as \$40 per 1000 cigars, or four cents apiece.

Next to Cuba, the best tobacco is grown in Virginia, while the product of Borneo, Ceylon, and the Philippine Islands is little inferior. Persia also produces a good article. Turkish tobacco is very aromatic. The name "Turkish" is loosely applied to the leaf grown in Syria, Roumelia, Karamania, and about the Persian Gulf. A light yellow tobacco is smoked in China, and some of it is exported thence to England. Japanese tobacco is of an inferior quality. Very excellent tobacco is that grown in the Dutch possessions in Java and Sumatra and shipped to Amsterdam, where the best cigars in Europe are most readily obtained. Burmese tobacco is fair. Mexico and South America, especially Brazil, produce a very aromatic tobacco. That of Brazil is said to be the quickest burning tobacco in the world. England is the only European country where no tobacco is grown. In Germany, inferior tobacco is produced along the Rhine, near Baden and at Mainz, and is for home consumption. In France, where tobacco is a government monopoly, it can be grown only by those who receive a special license. These producers have the choice of selling their tobacco to the government manufactories or of exporting it. In 1891, tobacco was cultivated in 22 departments of France. The strongest French tobacco is grown in the departments of the Nord and Pas-de-Calais. The government has 19 manufactories, of which two are in Paris.

The best cigars made in Europe of European tobacco are those manufactured in Seville, Spain. They are thought by many to equal the Havana Partido. In Germany and Belgium, many cheap imitations of Havana cigars are made from beet-leaves soaked in tobacco juice. Hamburg and Frankfort are the seat of an extensive manufacture of inferior cigars. Cigars may be purchased in Germany as low as three for a cent.

The United States produce more tobacco than any other country in the world, and export about half of the product, chiefly to Germany, England, France, Italy, Austria, and Holland, in the order named. The value of our tobacco export in 1850 was \$6,417,251; in 1860, \$15,917,901; in 1865, \$45,209,512; in 1870, \$22,705,225; in 1875, \$27,844,470; in 1880, \$18,442,273; in 1885, \$24,762,305; in 1890, \$25,355,601.

The average amount annually exported to our three great customers, is in each case as follows: Germany, 69,240,770 lbs.; to Gt. Britain, 50,105,427 lbs.; to France, 29,506,250 lbs.

The amount received by the United States government from the internal revenue tax on tobacco products is a large one. In 1865 it was \$11,401,373; in 1870, \$31,350,708; in 1875, \$37,303,462; in 1880, \$38,870,140; in 1885, \$26,470,088; in 1890, \$33,949,997.

The McKinley Tariff Act of 1891, largely increased the duty on imported tobacco and tobacco products. The old rate for cigar-wrappers was \$0.75 per lb.; the new rate, \$2.00 per lb.; old rate for "stemmed" tobacco, \$1.00 per lb.; new rate, \$2.75 per lb.; old rate for cigars and cigarettes, \$2.50 per lb.; new rate, \$4.50 per lb. The value of the tobacco imported in 1890 was \$21,710,454.

CIGARETTES. Of late years cigarette smoking has increased greatly, especially in the United States. As cigarettes are classed as cigars in the revenue returns, it is difficult to secure satisfactory statistics on this head. In 1880, however, more than 408,000,000 cigarettes were manufactured by American companies. The great manufactories of cigarettes are at New York, Richmond, Va., and Rochester, N. Y. The manufacture is now practically in the hands of a single "trust." In France, there are now seven factories exclusively devoted to the production of cigarettes, employing over 2000 women and turning out more than 400,000,000 cigarettes a year. In Spain, the consumption of cigarettes is very great, but the practice is for the smoker to roll his own, rather than to smoke the manufactured article. Of the foreign cigarettes imported into the United States, the most sought after are now the so-called "Turkish" or "Egyptian," made from tobacco grown in Roumelia and Syria, and made with mouthpieces. The coarse-rolled cigarettes from Cuba that were once in great vogue in this country are now little used.

SNUFF was originally made in Spain, and later in England, Scotland, Holland, and Belgium. It was at first made by grinding the leaf tobacco in mortars, and scenting the powder in various ways. It is now ground in metal mills by steam-power. The best-known brands are *Macebooy* (from Spain), *Rappee* (from France), and *Scotch* or *Lundy-foot*. The United States produce a small amount of snuff. In 1882, 6468 pounds were exported; but the practice of taking snuff is declining with every year, and at present it survives in this country chiefly in some parts of the South where the unpleasant practice of "snuff-dipping" still prevails. In the reports of the manufactories of tobacco, snuff is classed with chewing tobacco.

Tobacco is used as a sedative or narcotic over a larger area, and among a greater number of people than any similar substance, opium being the next to it in these respects, and the hemp-plant the third. Tobacco-leaves, when submitted to chemical analysis, yield nicotine (q.v.), which is its most characteristic constituent, albumen, a gluten-like substance, gum, resin, malic and citric acids, and a large amount of inorganic constituents, 100 parts of the dry leaf yielding from about 19 to 27 per cent of ash, in which potash, lime, and silica preponderate. In a physiological and medical point of view, the analysis of the smoke of tobacco is of far more importance than that of the leaf. From the researches of Dr. Richardson, it appears that although "the widest differences prevail in respect to the products arising from differing cigars, differing kinds of tobacco, and differing pipes," there are certain substances which are common to all varieties of

tobacco-smoke. Firstly, there is in all tobacco-smoke a certain amount of *watery vapor*, impregnated with various substances, from which it may be separated. Secondly, a small quantity of free *carbon* is always present; it is to the presence of this constituent that the blue color of the smoke is due. "It is this carbon," says Dr. Richardson, "which in confirmed and inveterate smokers settles on the back part of the throat and on the lining membrane of the bronchial tubes, creating often a copious secretion, which it discolors, and which is coughed up of a dark coaly appearance."—*For and Against Tobacco*, Lond., 1865, p. 5. Thirdly, there is a certain quantity of *ammonia* present. The presence of the ammonia gives to the smoke an alkaline reaction. Moreover, "it is the ammonia that bites the tongue after long smoking; it is the ammonia that makes the tongue and throat of the smoker so dry, and induces him to quaff as he smokes, and that partly excites the salivary glands to secrete so freely. The ammonia also exerts an influence on the blood."—Richardson, *op. cit.*, p. 6. Fourthly, *carbonic acid* is always present, as may be shown by its action on lime-water. The amount differs extremely in the smoke from different kinds of tobacco, but, according to Dr. Richardson, it may be fairly inferred that the sleepiness, headache, and lassitude which follow the prolonged inhalation of tobacco-fumes, are largely due to this agent. Fifthly, tobacco-smoke yields a *product having an oily appearance*, and possessing poisonous properties. It is popularly known as *oil of tobacco*; and on further analysis, it is found to contain three substances—viz., a fluid alkaloid, *nicotine*; a *volatile substance* having an empyreumatic odor; and an *extract* of a dark resinous character, having a bitter taste. The symptoms of tremor, palpitation, and paralysis which ensue after excessive smoking, especially in persons unaccustomed to indulgence in this practice, seem to depend upon the nicotine, which is known, by experiment, to be highly poisonous.

It is unnecessary to enter into details regarding the symptoms of slight tobacco-poisoning, because they are well known to the great majority of the male population. Fortunately, the effects produced by tobacco are very transitory, as the poison finds a ready exit from the body. The system, after being subjected for a few times to the poisons of tobacco-smoke, becomes accustomed to their influence, the distressing symptoms no longer occur, and a condition of "tolerance" is established. From the extensive investigations of Dr. Richardson, it appears that there are no grounds for believing that smoking can produce any organic changes. It may, however, produce various functional disturbances: (a) On the stomach. (b) On the heart, producing debility and irregular action. (c) On the organs of the senses, as dilatation of the pupil, confusion of vision, subjective sounds, etc. (d) On the brain, suspending the waste of that organ, and oppressing it if it be duly nourished, but soothing it if it be exhausted. (e) On the nerves leading to over-secretion of the glands which they control. (f) On the mucous membrane of the mouth, causing what has been described as the "smoker's sore throat." "The disease consists of an irritable state of the mucous membrane at the back of the throat, redness there, dryness, a tendency to cough, and an enlarged soft, sore condition of the tonsils, rendering every act of swallowing painful and difficult." It may exist without detection for a long time; but if a damp, cold, foggy state of the air comes on, the throat becomes troublesome and painful, enlargement of the tonsils is detected, and the symptoms become much aggravated by any attempt to smoke. This condition is more readily induced by the use of cigars than of pipes: it is quite incurable so long as the patient continues to smoke, but soon disappears when the use of tobacco is entirely suspended. In association with this condition of the throat, the gums are usually abnormally pale and firm. (g) On the bronchial surface of the lungs, sustaining any irritation that may be present, and increasing the cough. There is no evidence that tobacco-smoke can cause specific diseases, such as insanity, epilepsy, St. Vitus's dance, apoplexy, organic disease of the heart, cancer, consumption, or chronic bronchitis. If, as is universally allowed, tobacco possesses, like alcohol, arsenic (in minute doses), opium, tea, coffee, etc., the power of arresting the oxidation of the living tissues, and thus checking their disintegration, it follows (1) that the habit of smoking must be "most deleterious to the young, causing in them impairment of growth, premature manhood, and physical degradation" (Richardson, *op. cit.*, p. 73); and (2) that the habit may be conducive to the physical well-being of the individual, provided he cannot supply himself with sufficient nourishing food.

For a long controversy on the question, *Is Smoking Injurious to Health?* in which Sir Ranald Martin, Mr. Solly, Dr. Ranking, and other medical men took a part, the reader is referred to the 1st volume of *The Lancet* for 1857. The whole matter is very fairly summed up by Dr. Richardson in the excellent pamphlet from which we have so freely borrowed in this article—a memoir which we can cordially recommend to all who take an interest in this subject. Before the full maturity of the system is attained, even the smallest amount of smoking is hurtful; subsequently, the habit is, in most instances, only prejudicial when it is carried to excess. We cannot honestly say more against tobacco than can be urged against any other luxury, and of nearly every luxury it is the least injurious. "It is innocuous as compared with alcohol; it does infinitely less harm than opium; it is in no sense worse than tea; and by the side of high living altogether, it contrasts most favorably."—Richardson, *op. cit.*, p. 75. In conclusion, a word or two may be said regarding the kind of pipe that should be used. A long, perfectly clean pipe, composed of an absorbing material like clay or meerschaum, which can suck up the oily matter before it reaches the mouth, is always to be preferred; and M. Melseus.

to whom the scientific world is indebted for many ingenious applications of chemistry to hygiene and the treatment of diseases, has recently suggested, that if a plug of cotton, saturated with a strong solution of citric or tannic acid, were placed in the stem, so as to filter the smoke before it reached the mouth, all the nicotine would be seized by and combine with the acid. The different kinds of tobacco exert a different influence on the smoker according to the amount of noxious ingredients which they contain. Thus, cavendish, pigtail, and coarse shag yield the oily matters in much more abundance than Latakia or Turkish, which are hence termed mild tobaccos. Cigars produce dyspepsia much more rapidly than pipes, for in smoking them, unless with a long mouth-piece, nicotine is necessarily absorbed.

Snuffing is probably the least injurious form in which to take tobacco, and chewing the most deleterious; yet sailors, who chew more freely than any other class in this country, are usually men in vigorous health, and after prolonged practice the quantity they can consume is enormous. Dr. Arrott mentions the case of a harbor-superintendent, formerly a sailor, aged 64, in the almost uninterrupted enjoyment of good health, who chewed tobacco for upward of 50 years, and at length ate it, swallowing every particle of leaf and juice. For many years, he had been in the constant practice of "eating a quarter of a pound of the strongest negrohead every five days."

The effects which tobacco produces in large doses, when taken by persons unaccustomed to its use, in the form of powder, infusion, or excessive smoking, are "faintness, nausea, vomiting, giddiness, delirium, loss of power of the limbs, general relaxation of the muscular system, trembling, complete prostration of strength, coldness of the surface, with cold, clammy perspiration, convulsive movements, paralysis, and death. In some cases, there is purging, with violent pain in the abdomen; in others, there is rather a sense of sinking or depression in the region of the heart, creating a sense of impending dissolution. With the above-mentioned symptoms, there is a dilatation of the pupils, dimness of the sight, a small, weak, and scarcely perceptible pulse, and difficulty of breathing."—Taylor's *Principles and Practice of Medical Jurisprudence*, p. 321. Although there are two recorded cases of poisoning by nicotine, poisoning by tobacco has rarely given rise to medico-legal investigation. There is, however, reason to believe that porter is often drugged with tobacco or Scotch snuff, for the purpose of stupefying persons with a view to robbery. In all cases of poisoning with tobacco, if it has been swallowed, an emetic of a scruple of sulphate of zinc should be at once administered, and the most powerful stimulants, both external and internal, should be employed. Prof. Haughton has shown that nicotine and strychnine antagonize one another; on this assumption, strychnine, carefully administered, would be the proper antidote.

Tobacco has been used in medicine in the form of an enema, with the view of relaxing the muscular fibers, in cases of strangulated hernia, stricture of the bowel or urethra, tetanus, etc.; but in such cases, it has now been generally superseded by chloroform. If it continue to hold a place in the pharmacopœia, it will probably be as an antidote to strychnine.

It must be recollected that *Indian tobacco* has nothing in common with the subject of this article, and is a synonym for *lobelia inflata*.

In America the culture of tobacco began in Virginia with the earliest settlement of the colony. It is recorded that in 1615 the gardens, fields, and even the streets of Jamestown were planted with tobacco; which immediately became, not only the staple crop, but the principal currency of the colony. In 1619 "ninety agreeable persons, young and incorrupt," and in 1621, "sixty more maids, of virtuous education, young and handsome," were sent out from London on a marriage speculation. The first lot of these ladies was bought by the colonists for 120 pounds of tobacco each; the second lot brought 150 pounds each. By the year 1622 the annual product of tobacco amounted to 60,000 pounds, and it more than doubled during the next 20 years. The culture of this plant was introduced into the Dutch colony of New York in 1646, though it never gained the same prominence there as further south. But Maryland, the Carolinas, Georgia, and later Kentucky, made it the leading object of their culture almost from their first settlement. It long constituted the most valuable export of British America; but the product per acre had been diminishing for many years before the revolution, owing to the difficulty of supplying manure, and the consequent exhaustion of the soil. From 1744 to 1776 the exports of this crop averaged 40,000,000 pounds a year. Tobacco has now become a somewhat prominent crop in Massachusetts and Connecticut, and in both of these states its culture has rapidly extended. In 1850 but 138,246 pounds were raised in Massachusetts; in 1860 the crop increased to 3,233,198 pounds, and in 1870 to 7,312,885. Since the latter date it has fallen off, and in 1878 was 4,320,000; and 1883, 4,038,278 pounds. The aggregate yield of the country in 1840 was reported by the census of that year as 219,163,319 pounds; in 1850 it was reduced to 199,752,655 pounds; but in 1860 it went up to 434,209,461 pounds, to fall again in 1870 to 262,735,021 pounds, a fluctuation to be explained in part by the many casualties to which it is liable, damage by insects, hail, drought, frosts, etc. Though it is produced in all the states, there were only 15 states in 1880 that produced, each, as much as 1,000,000 pounds, while several counties in tobacco states yield each two, three or five

millions of pounds. Kentucky and Virginia were credited with more than half the crop, the former state alone 40 per cent of it. Only ten states separately exceeded 10,000,000 pounds, by the census of 1880: Kentucky, Virginia, Pennsylvania, Ohio, Tennessee, North Carolina, Maryland, Connecticut, Missouri and Wisconsin, in order of precedence. Connecticut grows some tobacco in every county, though Hartford co. was credited in 1880 with 9,039,514 pounds of the 14,044,652 pounds reported. Three Atlantic states, with four western, at one time monopolized the production, as may be seen by the following table:

| STATES. | 1850. | 1860. | 1870. | 1874. |
|----------------------|-------------|-------------|-------------|-------------|
| Virginia | 56,803,227 | 123,967,757 | 37,086,364 | 35,000,000 |
| Kentucky | 55,501,196 | 108,102,433 | 105,305,809 | 34,500,000 |
| Tennessee | 20,148,932 | 38,931,277 | 21,465,452 | 5,780,000 |
| Maryland | 21,407,497 | 38,410,965 | 15,785,339 | 16,500,000 |
| North Carolina | 11,984,786 | 32,853,250 | 11,150,087 | 8,500,000 |
| Ohio | 10,454,449 | 25,528,972 | 18,741,973 | 13,000,000 |
| Missouri | 17,113,784 | 25,086,196 | 12,320,483 | 13,800,000 |
| Total | 193,413,871 | 392,880,850 | 221,855,567 | 127,140,000 |
| Other states | 6,338,784 | 41,328,611 | 40,879,774 | 51,215,000 |
| Grand total | 199,752,655 | 434,209,461 | 262,735,341 | 178,355,000 |

None of the cotton states produce much tobacco, but one county in Florida, Gadsden, has long been celebrated for the production of Cuba tobacco, which always brings a high price. In 1880 there were 231 counties in the United States producing more than 100,000 pounds each, Lancaster co., Penn., leading, with a production of over 23,000,000 pounds. The number of acres planted in tobacco in all the states was, in 1883, 630,609, divided as follows: New Hampshire, 107; Massachusetts, 2,814; Connecticut, 8,145; New York, 5,440; Pennsylvania, 28,879; Maryland, 40,593; Virginia, 129,996; North Carolina, 60,000; Arkansas, 2,300; Tennessee, 40,221; West Virginia, 4,108; Kentucky, 230,116; Ohio, 32,128; Indiana, 11,863; Illinois, 5,679; Wisconsin, 12,750; Missouri, 15,400. The price per pound in 1880 ranged from 5-15 cents in the different states. There are a great many varieties of American tobacco, the exhibit in the economic museum of agriculture in connection with the department at Washington showing in 1877 90 specimens from 21 states, the best sample being a Virginia tobacco, said to have brought \$4 per pound. Included in the exhibit was a specimen of wild Indian tobacco from Arizona. The Connecticut seed-leaf is cultivated almost exclusively in New England, and in certain counties in New York. A cross from Havana seed is grown in Bucks co., Penn., much resembling imported Cuba tobacco. The Maryland tobacco is of two varieties, the broad leaf and the narrow leaf. The former commands a higher price; the latter yields a larger quantity. Much of it is exported, a large order being usually filled for the French government. There are in Maryland the bay tobacco, big Pryor variety, white stem, Frederick, etc. North Carolina produces the Gooch, white stem, yellow Pryor, big Orinoco, and little Orinoco; Tennessee has some of these, and also the big and little Frederick, blue Pryor, big stem, etc. Much of the Kentucky tobacco goes to Germany, Austria, and the north of Europe; certain varieties are sent to Mexico and to the coast of Africa. The white Burley, long green, Baltimore Cuba, twist bud, and big shoe-string, are among the Kentucky varieties. Rotation is commonly practiced with this crop. Thus, in the Connecticut valley it is customary to take from one to three crops of tobacco, then a hay or grain crop, followed by grass for several years. In the Onondaga district, N. Y., the order is clover, wheat, tobacco; Steuben co., clover, corn, tobacco; in Lancaster co., Penn., which produces a large proportion of the crop of that state, tobacco is preceded by corn and followed by wheat; in Virginia the custom frequently is to take off two or three crops of tobacco, followed by wheat, afterward clover or grass.—Up to 1877, tobacco had paid to the general government a revenue of more than \$426,000,000 in 16 years; meanwhile, it is a remarkable fact that the return to the government had been greater than that to the producers: the excess in 1877 reaching \$12,500,000.

The following table shows the production of tobacco in the United States in 1889, by states:

| STATES. | Pounds. | Acres. | Value. | STATES. | Pounds. | Acres. | Value. |
|----------------------|-------------|---------|------------|------------------------------------|-------------|---------|--------------|
| Arkansas | 1,156,000 | 2,408 | \$80,909 | Ohio | 35,195,000 | 39,105 | \$2,745,171 |
| Connecticut | 9,603,000 | 6,136 | 1,248,369 | Pennsylvania | 24,180,000 | 19,500 | 2,587,260 |
| Illinois | 2,947,000 | 4,648 | 223,959 | Tennessee | 45,641,000 | 67,119 | 3,651,274 |
| Indiana | 16,153,000 | 18,252 | 1,130,711 | Virginia | 64,034,000 | 127,052 | 3,842,052 |
| Kentucky | 383,306,000 | 323,409 | 21,247,971 | West-Virginia | 4,496,000 | 5,620 | 359,680 |
| Maryland | 14,017,000 | 33,775 | 770,914 | Wisconsin | 12,846,000 | 13,813 | 1,220,379 |
| Massachusetts | 3,893,000 | 2,464 | 486,640 | Other States and Territories | 2,976,000 | 6,613 | 312,464 |
| Missouri | 13,109,000 | 14,126 | 1,048,714 | Total | 565,795,000 | 747,326 | \$43,666,665 |
| New-York | 6,488,000 | 6,179 | 778,554 | | | | |
| North-Carolina | 25,755,000 | 57,107 | 1,931,644 | | | | |

The product of tobacco in Europe is nearly equal in quantity to the average production of the United States. Neumann-Spallart has usually made it about 500,000,000 pounds. Austria-Hungary produces about one-third of it, Russia one-tenth, Germany nearly as much, France about 35,000,000 pounds, and the other countries a small quantity. Europe can easily produce all the tobacco required, but two reasons are prominent for importation of tobacco from this country. It is very cheap, and it is very desirable for mixing with and fortifying European leaf. If it becomes dearer, a smaller quantity is purchased; if very much dearer, it would scarcely find sale at all. The production is regulated and limited by governmental edicts. Our exportation is not increasing; the proportion of our crop exported is declining, and will continue to fall off as our population increases.

TOBACCO-HEART. A name used of the cardiac symptoms that occur in many persons who use tobacco to excess. Irregularity of action and debility are the chief of these. See **TOBACCO**.

TOBACCO-PIPES, are made of various materials, the commonest in Europe being a fine white clay, which has consequently received the name of *pipe-clay*. Their usual form is too well known to need description, but the manufacture of a clay tobacco-pipe is by no means a simple affair. The first part of the operation is performed by trained children, who, with nice skill, roll out upon a board a small piece of clay into a long slender cylindrical rod, at the end of which is then attached a lump of clay, just enough to form the bowl. These rudimentary pipes are arranged by dozens on a board, until they have become sufficiently hardened. They are then handed to the pipe-maker, who takes a pointed iron wire, and first dipping it into oil, pushes it into the end of the thin column of clay, and having passed it through, forms the bowl with a folding brass mold. The wire is then withdrawn; and after a slight dressing with a knife, the pipes, now complete, are slightly curved in the stem, and are laid by to dry for a few days, when they are removed to the kiln, which is of a peculiar construction, and consists of an interior chamber, with a number of small stages, so that the pipes can be conveniently arranged in circles without touching each other. This interior chamber can be closed so as to exclude smoke, and, in fact, is only a *seggar* on a large scale, such as is used in making pottery (q.v.). The fire acts all round it, and fires or burns the pipes without smoking them. When thoroughly baked, they undergo a kind of polishing or dressing, and are fit for sale. Finer and more expensive pipes are made of *meerschau* (q.v.). Under the head of **PIPE-STICKS** will be found an account of the various materials used for making the tubes of these and other pipe-bowls. *Brier-root pipes*, now very common, have the bowl and stem made of one piece of wood; and although the stem is short, they partially absorb the oil produced in smoking.

Various opinions have been entertained as to the antiquity of the practice of smoking, and consequently of the use of pipes. That pipes for smoking herbs for medicinal and other purposes were in use in England and elsewhere long before the introduction of tobacco, is tolerably certain, and the custom is still prevalent in some places. Colt's-foot, yarrow, mouse-ear, lettuce, and other plants are occasionally smoked, and no doubt have been so for centuries. A primitive kind of pipe, doubtless such as has been made generation after generation, is still in use in some remote districts. It consists of a stick of elder from which the pith has been removed, with a bowl formed of common clay, and dried by the kitchen-fire. However much the habit of smoking herbs might obtain in Britain before that time, it is certain that the introduction of tobacco is to be traced the rise of the trade of the pipe-maker. Pipes have been found in situations near the Roman wall in Northumberland, and other Roman stations in Britain, suggesting the idea that they were used by the Roman soldiers. But this opinion was relinquished by Dr. Bruce, the antiquary, who first propounded it; and very few now imagine that any of the pipes to be seen in the antiquarian museums of Europe are many centuries old. The names Danes' pipes, Celts' pipes, elfin pipes, fairy pipes, old man pipes, etc., are popularly given to these old pipes, but afford no evidence as to their real antiquity. Many of them are remarkable for their very small size, whence, perhaps, some of the names; but this is easily accounted for by the consideration of the very high price of tobacco when first introduced into Europe, and the manner in which it was used, the smoke inhaled by the mouth being expelled through the nostrils, so that the narcotic power of the herb was enjoyed to the utmost. Similar very small pipes have also been found in North America, and the same mode of using tobacco has always prevailed among the American Indians. See Wilson's *Prehistoric Man*, vol. ii. Stone pipes, or pipe-bowls, have also been found in Britain, cut in rude forms, and which apparently were used by the insertion of a tube, perhaps a straw. Such pipe-bowls, but elaborately carved, are among the most remarkable American antiquities. They continue, however, to be made by the American Indians to the present day, often of stone, which are not cut without great difficulty, and are adorned with figures of men and animals. Some of them are adapted for the insertion of two tubes, that two smokers may inhale the fumes of the tobacco at once. Among some of the American tribes, the greatest care is bestowed on the ornamenting of the pipe-stem; by others, on the bowl.

The clay-pipe, much the same as is now used, probably came into use very soon after the introduction of tobacco in Britain. Aubrey, writing in 1680, says that tobacco-smokers at first used silver pipes, "but the ordinary sort made use of a walnut-shell and a straw." In the reign of William III., pipes were occasionally made of brass and of

Iron. Examples of these are preserved in various collections. The pipe was, in the earlier days of smoking, passed round the table—one man taking a whiff or two, and then handing it to his neighbor; thus, one pipe of tobacco would “suffice three or four men at once.” It has been supposed by some writers that the smaller the pipe, the more ancient is its date; but this is decidedly an error. The better criterion of age is the *form*. The barrel-shaped bowl was most usual during the commonwealth and the reign of Charles II., although it was made in many various shapes, which are well known from representations of them in prints of the time and on the traders’ tokens. In the reign of William III., a more elongated form of bowl began to be prevalent, probably introduced from Holland, although the barrel-shaped bowl still continued to be used. In the middle of the 18th c., the wide-mouthed bowl, now so universal, became the prevalent form, and the spur, which had hitherto been flat, to rest the pipe upon when in use, was elongated, after a fashion supposed also to have originated in Holland. The Scottish *catty-pipe* and Irish *dudeen* are short clay-pipes.

In Germany for ordinary smoking, the porcelain pipe-bowl is more used than the clay. They are made of very pure kaolin and covered with an enamel. Pipes of red clay in Oriental designs and long stems have come into use of late in France.

The finest pipes are made from *meerschaum* (sea-foam). The first meerschaum pipes were probably made in Hungary in the early part of the last century. Two samples of pipes, made as early as 1724 from a block of meerschaum brought from Turkey, are now in the Pesth Museum. Blocks of this precious material are found in three or four departments in France, as well as in Italy, Spain, Greece, and the Crimea. The finest deposits of magnesite are found at Anatolia, in Turkish Asia, where it is extracted in the same manner as coal. When taken out of the ground it is so soft that it can be cut with a knife. Its color is yellowish white. The rough blocks are dried and submitted to certain preparations before being sent to the town of Eskee Shehr, where they are examined, roughed out, polished, and glossed. This last operation consists in rubbing them while they are moist with a woolen cloth impregnated with mutton grease. Then the blocks are classified according to their quality, into sublime, superior, first-class, second-class, etc. Large pieces of superfine quality and exempt from defects are very rare. The blocks are packed in cases of an average weight of sixty to eighty pounds. A case is worth more in proportion, as it contains a smaller number of blocks, for then they are larger in size. Although the price varies according as the production is more or less abundant, it averages from \$120 to \$160 a case for the inferior qualities, and \$360 to \$400 for the finest qualities. For their own use the Turks prefer the red clay pipe, and send their meerschaum to Europe and America. The most artistic pipes are to-day made in France, although formerly the Germans and Austrians had a monopoly of this special manufacture. The Germans, however, still lead the market in the fabrication of imitation meerschaum pipes made of a composition of real magnesite splinters mixed with oil and turpentine. The objection to these is that they color badly, burn and crumble.

See the designs of pipes of all countries given in *Smokiana* (Quaritch, London, 1890).

The pipe-makers of London, as early as 1601, had privileges which gave them a monopoly. In 1619 the craft of pipe-makers was incorporated in England. Holland has long been famous for pipe making. The Dutch manufacturers were very jealous of rivalry. In the middle of the last century a pipe-manufactory was established in Flanders, and the Dutch makers determined to ruin it. The duties were too high to admit of a large importation, and they therefore freighted a large ship entirely with tobacco-pipes, set sail to Ostend, and purposely wrecked her there. In accordance with the maritime laws of that city, the pipes were landed from the wreck, and sold at such “ruinous prices” as defied competition; and the new manufactory at once sunk, and was closed.

TOBAGO, one of the Windward islands (see ANTILLES) belonging to Britain, lies 60 m. s.e. of Grenada, and 20 m. n.e. of Trinidad, is 26 m. long, from 6 to 9 broad, and has an area of 114 sq. miles. The island was discovered by Columbus in 1498, and named by him Assumption; the name of Tobago is supposed to have arisen from the free use of tobacco by the Caribs when first visited by Europeans. It came into British possession in 1763. From its gloomy-looking mountains, dense forests, and abrupt precipices, descending to the sea, Tobago has been called the “Melancholy isle;” but, on a nearer approach, the aspect becomes more pleasing, though still rough and irregular, being extensively occupied with conical hills and spurs, all connected by a ridge running through the interior, the greatest elevation of which is 1800 ft. above the level of the sea. From the high ridge descend deep and narrow ravines, which terminate in small alluvial plains. Scarborough is its chief town, pleasantly situated on the shores of Rochley bay, and at the base of a conical hill rising 422 ft. in altitude, crowned by fort King George. Plymouth, another town, is situated opposite Scarborough, on the leeward shore, about 6 m. distant, and is the landing-place for passengers, etc., from the royal mail-steamers. Two-thirds of the island is still covered with primitive forests, comprising many varieties of hard-woods and ornamental trees. The geological formation of the island is, on the whole, similar to that of Trinidad. Tobago is considered to be the island which Defoe describes in his *Robinson Crusoe*. The pop. in '91 was 18,353. The island produces sugar, rum, molasses, cocoanuts, cotton, coffee, and indigo; pimento also grows wild. The island was united administratively with Trinidad in 1880, and is governed by a subordinate commissioner.

TOBERMORY. See MULL, ISLAND OF.

TOBIT, BOOK OF, one of the most curious and interesting of the Old Testament apocryphal books. It exists at present in Greek, Latin, Syriac, and Hebrew MSS., the texts of which differ considerably, yet not materially, from each other. The oldest and most valuable is the Greek Septuagint; indeed, where the others depart from it, they possess little claim to our respect, although the *original* text was certainly not Greek. When and where the book was written, are questions to which various answers have been given; but the opinion of Ewald, who selects Persia as the scene, and the middle of the 4th c. B. C. as the date of its composition, agrees best with its internal character. The author he imagines to have been a Palestinian Jew who wrote in Hebrew, and conjectures that a translation of the work was made into Alexandrian Greek in the 1st c. B. C. That the contents of Tobit are not historical scarcely requires proof in modern times; yet up to the period of the reformation no serious difficulty was felt in receiving it as such. Luther was the first to speak of it as a "poetical," i. e., an imaginary, didactic production; and since his time biblical critics have been pretty unanimous on the point; although some contend for what they call a historical basis. The leading incidents of the story do not differ by a hairbreadth in grotesque and puerile *miraculousness* from the fantastic extravaganzas of the Arabian Nights. Tobit, sleeping outside the wall of his court-yard one night, is blinded by sparrows "muting warm dung into his eyes;" his son Tobias is attacked on the Tigris by a fish, which leaps out of the water to assail him; and marries a Jewish maiden called Sara, seven of whose betrothed lovers had been successively carried off by an evil spirit called Asmodeus. Asmodeus is driven off by an angel—who first appears under the name of Azarias, but subsequently turns out to be Raphael—and then flies to the uttermost parts of Egypt, where he is bound. Old Tobit is cured of blindness by an application to his eyes of the gall of the fish that had tried to devour his son. The sentiments are often very pious and didactic, the descriptions of social life are picturesque, and apparently true, but no excellence of that kind can reconcile us to the childish absurdities of the story.

TOBOGGAN (corruption of Indian *odabagan*), a sled without runners, common in Canada. It is turned up at one end, and is used on either natural or artificial slopes. In its primitive form, it consisted of one or two pieces of thin, flat wood; the modern toboggan is usually made of 7 rock-maple, kiln-dried slats, oval-shaped on the bearing surface, and is 18 in. wide and 6 or 7 ft. long. Another sort of T. is drawn by dogs over soft and deep snow.

TOBOLSK', a government of w. Siberia, occupies the n.w. angle of the country, and is by the governments of Yeniseisk and Tomsk. Area, 564,825 sq. m.; pop. '94, 1,411,475, mostly Russians, but including also Ostiaks, Tartars, Bokharians, and Samoides. The northern part of the government is a frozen swamp for the greater part of the year, while in the south good agricultural land is to be found. There are rich mines of silver, iron, copper, gold, and platinum in the mountains. The chief rivers are the Ob (q. v.), and its great navigable affluents, the Irtish, Tobol, Om, and Toura.

TOBOLSK, a town of western Siberia, capital of the government of the same name, stands at the confluence of the Irtish and the Tobol, about lat. 58° 21' n. It is well built, with timber houses and wide and regular streets, and its position on the two great rivers is picturesque; but its lower part is subject almost annually to inundation from the high floods of the Irtish in spring. Its situation, considerably n. of the great commercial highway between Russia and Siberia, and at a distance from the more productive regions of the country, is unfavorable for the development of commerce. Tobolsk contains a large prison. There are manufactures of leather, soap, and powder. Several regiments are stationed here. Pop. '93, 23,980.

TOCANTINS, an important river of Brazil, South America, rises in the province of Gojas, flows n. through the province of Para, and joins the waters of the Para (q. v.), the southern branch of the estuary of the Amazon, 130 m. from the Atlantic. Its principal affluent is the Araguay, which joins it in lat. 6° south, and has a longer course and bears along a greater volume of water than the stream to which it is tributary. The Tocantins, at its junction with the Araguay, is 5500 feet wide; at its mouth is 8 m. wide. Total length from Para, about 1700 miles.

TOCHER, in the law of Scotland, is an ancient name for the marriage-portion given by a father on the marriage of his daughter. It is settled according to the wish of the father, or as may be agreed with the intended husband of the daughter. Where the father by will leaves a legacy to his daughter, and afterward during his lifetime gives her a like sum as a tocher, this is not presumed to be a satisfaction of the legacy, though it is otherwise in England. See MARRIAGE.

TOCQUEVILLE, ALEXIS CHARLES HENRI CLEREL DE, a French statesman, and the most eminent writer of this century on the science of politics, was born at Verneuil, in the department of Seine-et-Oise, July 29, 1805. His father was the representative of an old family, the Clerels, proprietors of Tocqueville, in Normandy. The Clerels, although in the direct line *noblesse d'épée*, had been closely connected with the magistracy, and, indeed, might be considered to belong more properly to that order, which in France has

produced so many distinguished men. The mother of De Tocqueville was a granddaughter of Malesherbes, the academician, political writer, and magistrate, who defended Louis XVI. at the bar of the Convention, and whose fearless intrepidity was punished by the execution of himself and all the most distinguished of his relatives. Mme. de Tocqueville and her husband narrowly escaped the guillotine by the fall of Robespierre; but they did not emigrate, like other royalist families, and they preserved their property. At the restoration in 1815, the father of De Tocqueville re-assumed the title of count, which belonged to the family before the revolution. Young De Tocqueville was called to the bar at Paris in 1825; and after a short tour in Italy, entered the magistracy as *juge auditeur* at Versailles. In this situation he carefully studied the administrative system of France; and, struck by the perpetual recurrence of revolution, devoted much thought to political questions. In 1831 he threw up his appointment at Versailles, and with his colleague there, M. Gustave de Beaumont, accepted a government mission to America, to report on the working of the penitentiary system. The commissioners, after their return to Europe, published their report (*Du Système pénitentiaire aux Etats-Unis*, 1832; Eng. transl., Philadelphia, 1833)—an admirable work, which modified all the ideas previously entertained in France regarding prison-discipline. But this was not the most important result of their inquiries. In 1835 De Tocqueville published his great work, *De la Démocratie en Amérique* (Eng. transl. by Reeve, London, 1835). In his introduction he sought to show that a great democratic revolution has for centuries been going on in Europe. There is a general progress toward social equality, which must be looked on as a providential fact. In France it has always been borne on by chance, the intelligent and moral classes of the nation never having connected themselves with it, in order to guide it. In America he found that the same revolution has been going on more rapidly than in Europe, and has indeed nearly reached its limit in the absolute equality of conditions. There, accordingly, he thinks we may see what is about to happen in Europe. He points out that the people in America may be strictly said to govern. They make the laws and administer them. He draws from what he has observed the conclusion, that democracy may be reconciled with respect for property, deference for rights, safety to freedom, and reverence for religion. He does not propose the laws and manners of the Americans for the imitation of other democratic peoples. He merely seeks, by a faithful picture of an existing democracy to allay the dread of democratic progress, and to induce those at the head of affairs to recognize it as irresistible, and to seek to control it by wise concessions. *The Democracy* made at once a great sensation. The accuracy of the statements, the skill with which the matter had been digested, and the beauty of the style, were loudly praised by critics. The author was described as the continuator of Montesquieu, and the greatest political writer of his time. He became successively a member of the academy of moral sciences and of the French academy. In 1835 De Tocqueville visited England, where his work had made him known, and where he received an enthusiastic welcome from the leaders of the whig party. In the same year he married Miss Mottley, an Englishwoman. He shortly afterward, by a family arrangement, entered into possession of Tocqueville. He stood in 1837 as candidate for the representation of Valognes in the chamber of deputies. His opponent was a retired mill-spinner, who raised the cry of "No nobles" against him. Alluding to the great dovecot of Tocqueville, his opponent said: "Prenez garde! Il va vous remener les pigeons." De Tocqueville was defeated; but two years after he had become a great favorite with his neighbors, the Norman farmers, and they returned him to the chambers by an overwhelming majority. As a speaker, De Tocqueville did not succeed, but he exercised great influence on the legislature. Immediately after the revolution he was the most formidable opponent of the socialists and extreme republicans. He opposed Louis Napoleon as one who believed in his right to the throne as firmly as Charles X. He became, however, in 1849, vice-president of the assembly; and from June to October in the same year, minister of foreign affairs. At this time he vindicated the policy of the expedition to Rome, on the ground, it must not be forgotten, that it would secure liberal institutions to the states of the church. After the *coup d'état*, he returned to Tocqueville, where he devoted himself to agricultural pursuits. He there wrote *L'ancien Régime et la Révolution* (Par. 1856; Eng. transl., London and New York, 1856), a work worthy of his fame. In June, 1858, he broke a blood vessel, and was obliged to leave the bleak coast of Normandy for a warmer climate. He took up his abode at Cannes, where lord Brougham and chevalier Bunsen spared no effort to soothe his lingering illness. He died there April 16, 1859. De Tocqueville's *Œuvres et Correspondance Inédites* were published in 2 vols. (1860), by his friend M. de Beaumont, who prefixed a biographical notice. The English translation of this work appeared at London and New York in 1861.

TOCSIN (French *toque-sin*; from *toquer* "to hit," and Old French, *sein* "a bell"). A bell sounded with loud double-quick strokes to alarm the people. In the French Revolution it was often a signal to revolt.

"Since the 14th of July, the tocsin had been the quickstep of the great seditions of the people."—Lamartine.

The word is sometimes used figuratively.

TOD (derivation unknown), a weight for wool now unused; it was fixed at 28 lbs. avoirdupois in 1671.

TODARS, **TODAWARS**, or **TUDAS**, a remarkable race inhabiting the upper part of the Neilgherry mountains (q.v.), in southern Hindustan. They are rapidly diminishing in number, chiefly owing to the practice of polyandry (q.v.), and their not allowing intermixture with other races; in 1871, it appears that only 693 were left. They are tall, well proportioned, and athletic, with finely molded limbs, and bold, independent carriage; the nose aquiline, with black, bushy hair and beard. The dress of the men consists of a single toga, worn so as to leave the right arm free, not unlike the plaid of the Scottish Highlander. Both sexes are of a dull copper color, but the women are rather fairer than the men, and are often tall and handsome in feature and person. They have no occupation except tending their herds of buffaloes, and converting the milk into butter. The buffalo, indeed, is so important to them, that they look on the pen where the herd is cooped up at night with superstitious veneration. They never attempt the cultivation of the land around them, as they obtain what grain they require from the Burghers and other agricultural tribes, who pay it in the shape of tribute (*goodoo*) for the lands they cultivate, over which the Todars assert an imaginary right. The Todars hold that their ancestors were the aboriginal inhabitants of these regions (see *INDIA, Inhabitants*); that the Kothers, and afterward the Burghers, came among them; and that they allowed these tribes to cultivate land on condition of paying a *goodoo* of one-sixth of the harvest. The Burghers continue to pay their tribute of grain, but only in such amount as suits their own wants and inclinations, and rather in the shape of charity than otherwise. The only use the Todars get of the buffaloes, besides their milk, is to furnish sacrifices to the manes of the dead. They are wont to salute the sun at his rising and setting, and believe that the soul after death goes to the "great country." They have no distinct places of worship, except the hut in which they keep their milk, where they pour out in libations to their deities what remains after their daily consumption. They have never been known to steal the smallest article. No civil servant, or native of any of the other tribes, has ever been able to acquire their language, which has no written character, and not the slightest affinity with Sanscrit. Their mode of collecting the *goodoo* is singular enough: "As soon as harvest is over, and the *goodoo* collected in *Todanaad*, the *Toda* men of that division pay visits to the *munds* (villages, or groups of huts) in *Meyleanaad* and *Paranganaad*, and take up their abode with the women of the community (to the temporary exclusion, as is the custom, of the legitimate husband). They then pay visits to the surrounding Burgher villages, and demand in their right, as temporary husbands of the women of the *naad*, the *goodoo*, which, strange to say, is paid; and thus the same man, perhaps, who has laid a whole village in his own *naad* under contribution, goes the round of the other two *naads*, appropriating the fruits of the Burghers' labor and industry, and carrying off enough grain to support his whole community in idleness and plenty until the arrival of the next year's harvest-time, and to produce by sale in the nearest bazaar sufficient money to pay the tax which is levied yearly on their tribe. I should have refused credence to such a statement, had I not received it on the best authority, that of the *tahsildar* of the district."

TODD, a co. in s. w. Kentucky, adjoining Tennessee; drained by Pond river, Elk creek, and other streams; traversed by several branches of the Louisville and Nashville railroad; 360 sq. m.; pop. '90, 16,814, includ. colored. The surface is hilly. The soil is fertile. The principal productions are tobacco, wheat, corn, and cattle. Co. seat, Elkton.

TODD, a co. in central Minnesota; drained by the Partridge and Long Prairie rivers; traversed by the Great Northern and the Northern Pacific railroads; 972 sq. m.; pop. '90, 12,930, chiefly of American birth. The surface is level. The soil is fertile. The principal productions are wheat, oats, butter, and live stock. Co. seat, Long Prairie.

TODD, a co. in S. Dakota, touching Nebraska, drained by the Missouri; about 45 sq. m.; pop. '90, 188, chiefly of American birth. The surface is diversified. The soil is productive; but little of it as yet is under cultivation. Co. seat, Fort Randall.

TODD, HENRY JOHN, 1763-1845; b. England; graduated, Oxford, 1785; vicar of Milton, 1792; rector of All-Hallows, London; keeper of the mss. at Lambeth Palace, 1803; rector of Settrington, Yorkshire, 1820; prebendary of York, 1830; archdeacon of Cleveland, 1832. He published among other books, *Poetical Works of John Milton*, with notes and a life; *The Works of Edmund Spenser*, with notes and a life; *Illustrations of the Lives and Writings of John Gower and Geoffrey Chaucer*; a new edition of *Johnson's Dictionary*; *Life of Archbishop Cranmer*.

TODD, JOHN, D.D., 1800-73 b. Vt.; graduated Yale college, 1822, and Andover theological seminary, 1826; Congregational pastor at Groton, Mass., 1827-31; of the Edwards church, Northampton, 1833-36; of the First Congregational church, Philadelphia, 1836-42; of the First Church, Pittsfield, Mass., 1842-72. He was one of the founders of Mount Holyoke Female Seminary. He published, *Lectures to Children*; *Students' Manual*; *Index Rerum*; *Sabbath School Teacher*; *Truth Made Simple*; *Great Cities*; *Lost Sister of Wyoming*; *Young Man*; *Simple Sketches*; *Stories on the Shorter Catechism*; *Summer Gleanings*; *Daughter at School*; *Bible Companion*; *Future Punish-*

ment; Mountain Gems; The Water Dove, and other Gems; The Angel of the Iceberg; Nuts for Boys to Crack; Polished Diamonds; Hints and Thoughts for Christians; The Great Pacific Slope. He had a vigorous and original mind, much practical shrewdness and wit, and fine descriptive power. Dr. T.'s works had immense circulation.

TODD, THOMAS, 1765–1826; b. Va.; served in the revolutionary army when but a boy, and in 1786 moved to Kentucky. He practiced as a lawyer at Danville, was clerk of the district court and court of appeals, and judge of the latter, 1801–06. In 1806 he was made chief-justice of the state, and the following year a justice of the U.S. supreme court, which position he retained until his death.

TODHUNTER, ISAAC, an English mathematician, b. in 1820; was educated at London and Cambridge, and became lecturer in mathematics at St. John's college, Cambridge. He wrote a series of text-books on mathematics. D. 1884.

TODI, a t. in central Italy, in the province of Perugia, 23 m. s. of the city of that name. It is surrounded by the ruins of Etruscan walls, and is built on a high hill overlooking the river Tiber. It has a Gothic cathedral with frescos by Le Spagna, and the ruins of a temple belonging to the Roman era. In 552 it was the scene of the decisive battle of Narses against Totila the Goth, in which the latter was killed, and the Goths defeated—this victory leading to the capture of Rome. Pop. commune, '81, 15,325.

TODIDÆ, or the **TODIES**, a family of tropical birds, of the tribe *pissirostres*, of the order *inseores*. Some of the groups are restricted to South America and the West Indies; others to India and the Eastern archipelago. They are birds of showy plumage and rapid flight. Their food consists of worms, small reptiles, insects, and occasionally berries. The *rollers* are the only representatives of the tribe in temperate parts of the old world, and they differ considerably from the common form, the bill being much longer and narrower than in the tropical todies. One species, the *garrulous roller*, is an occasional visitor of the British isles. It is about the size of a blue-jay, and is a beautiful bird. The more typical todies have short rounded wings, short tail; tarsi long and slender; toes three in front and one behind, well developed; claws short and well curved. Except while breeding they are solitary. They are said to make their nests in holes in the ground, laying from three to four eggs. Five species are enumerated by Sharpe.

TODLEBEN, FRANZ EDUARD, Russian gen. of engineers, was b. at Mitau, Russian province of Courland, in 1818. After studying at Riga, he was admitted as a student in the college of engineers at St. Petersburg. He was 2d capt. in the engineer corps when the Russian army entered the Danubian principalities in 1853, and served in the campaign of the Danube under Gen. Schilders. His genius as a military engineer was discovered before the Russian army crossed the Pruth, on its retreat from the principalities; and when the French and English troops undertook the siege of Sebastopol, col. Todleben was sent to assist in its defense. It was in the middle of April when he arrived, and the fortifications were soon placed under his direction. The principle on which he acted was to watch the works of the allies, and to establish against them on every point a superiority of fire, by multiplying the number and increasing the caliber of his guns. The prodigious activity displayed by the Russians in making good the damage sustained by the heavy fire of the enemy, filled the allied army with astonishment. Everywhere, massive ramparts of earthworks, mounted with formidable batteries, rose up as if by magic at each threatened point within the line of defense. According to Todleben, the defense was rapidly asserting an engineering superiority over the attack. The Malakoff, however, was carried by assault, and the allies entered Sebastopol (see *History of the Russian War* (illustrated), W. & R. Chambers). At the battle of Inkermann, Todleben, who was on the spot by chance, seeing that the Russian artillery was in danger of being taken, promptly halted a regiment, and caused four guns to open fire on the allies, and gave time to the artillery to retreat. At the latter part of the siege he was wounded in the leg, but all his great defenses had then been completed. After the conclusion of peace, he expanded what was at first a mere engineer's report into a history of the war in the Crimea. It is entitled *Défense de Sebastopol: ouvrage rédigé sous la Direction de Lt.-Gen. El. de Todleben, aide-de-camp général de S. M. l'Empereur*. In this work he writes a thoroughly Russian account of the Crimean war. In all that relates to the Russian army and its labors, and especially in regard to the work of the siege, the author may be accepted as an unimpeachable authority; but where the British and French armies are concerned, he is too often careless and inexact, and sometimes his statements are absolutely untrue. For services in the siege he was created a gen. and decorated. In 1865 he visited England, and was cordially received. He performed distinguished service in the war with Turkey in 1877–78. He died in 1884.

TODMORDEN, a market-t. of England, in the co. of Lancaster, on the border of Yorkshire, 6 m. n.e. from Rochdale, on the Manchester railway. The town is well built, has several churches and schools, and manufactures of cotton. Coal abounds in the vicinity. The town proper of Todmorden is composed of houses belonging to three townships, the pop. '81, being 23,861; '91, 24,725.

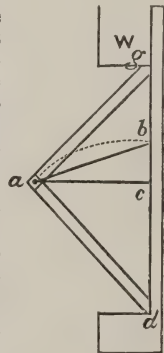
TOFFEE, or **TOFFY**, a sweetmeat made of sugar, melted with about half its weight of butter. Much care is required in making it, to insure its being crisp when cold. It

should be kept over the fire and slightly simmered for a quarter of an hour, when small drops are taken and let fall on a marble slab to cool quickly for trial; if they become brittle, it is complete. Everton, near Liverpool, has a name for its toffee.

TOGA (from Lat. *tego*, to cover) was the principal outer garment of the Romans, and originally, perhaps, the only one. Subsequently, an under-garment, the *tunic*, was added. It was probably of Etruscan origin, and yet it came to be considered the distinctive badge of the Roman citizen, whence the Roman people are called *togati*, or *gens togata*; and consequently, when the Cisalpine Gauls received the rights of citizenship, their country was spoken of as *Gallia togata*, in opposition to transalpine Gaul, or *Gallia braccata* (breeched). At first it was apparently semicircular in shape—so, at least, say Dionysius, Quintilian, and others—but afterward, when it came to be an elaborate and complicated dress, it must have been a smaller segment than a semicircle. The mode of wearing the toga is difficult to describe, and required considerable art to make the folds fall gracefully. The toga was made of woolen cloth, and except in the case of mourners, was of a white color. Accused persons sought to excite sympathy by going about in a soiled (*sordida*) and unsightly toga; while those who were seeking office were wont to dress themselves out in garments which had been made artificially bright by the help of chalk, hence their name of *candidati* (lit. shining ones), candidates. The *toga prætexta* had a broad purple border, and was worn by children, and most though not all of the magistrates. The *toga picta*, so called from being ornamented with embroidery, was worn by generals when enjoying their "triumphs." Under the emperors, the toga, as an article of common wear, fell into disuse, the Greek *pallium* and other garments being used instead; but it continued to be used by officials on solemn or festive occasions.

TOGGENBURG, or **TOCKENBURG**, a district in Switzerland, within the canton of St. Gall, formed by the long and fertile valley of the Thur. It was formerly governed by counts of its own, who ranked as the richest and most powerful land-proprietors in the country. On the extinction of their line in 1436, the possessions passed to the barons of Rasen, who sold them in 1469 to the abbot of St. Gall. Since 1803 Toggenburg has formed part of the canton of that name.

TOGGLE JOINT, a mechanical appliance sometimes called a mechanical power, acting on the principle of the inclined plane, as will be seen by the following demonstration. Let *ad* and *ag* represent the arms of the toggle joint, with the joint at *a*. Then, if the arms are brought to a perpendicular, the end *d* being stationary, the point *a* will move through the arc *ab* to *b*, and at each point in the arc in the direction of a tangent at that point. As the point *a* approaches *b* the tangent will become more and more horizontal, and at last perpendicular to the arms *ad* and *ag*. When they form one and the same straight line the weight *w* will have been raised to twice the height *bc*. The form in the figure here presented is given to show more clearly the action of the knee and elbow joints in man, but that which is more frequently used, particularly in hay and cotton presses (to which the appliance is peculiarly adapted) makes the ends *d* and *g* of the arms approach each other, applying the power at *a*, making *ac* the perpendicular. It will be seen that on the application of power the motion of the point *a* will at first be quite rapid (when the hay or cotton is loose) becoming slower and slower as the points *d* and *g* approach each other, so that when both arms become very nearly perpendicular the weight, or resistance will move very slowly; but the power will be extremely great, and adapted to the resistance offered by the greatly compressed bale. See **INCLINED PLANE**.



TOGOLAND, a German colony on the slave coast of west Africa, in Upper Guinea, lying between the French colony of Dahomey on the e. and the Gold Coast colony on the w., with an estimated area of 23,160 sq. m., and a native population of about 2,500,000. European pop. '95, 88. It has been a German protectorate since 1884. The principal towns are Togo, on lake Togo (pop. 8000), the capital Sebbe, and the seaports Lome, Little Popo, and Porto Seguro. The natives grow maize, yams, tapioca, ginger, and bananas, and coconuts, palm oil, caoutchouc, ivory, and dye-woods are exported. The climate at the coast is unhealthy for Europeans.

TOISE, in the ancient French system of measures, was the unit of linear dimension, and was divided into 6 ft., each foot (*pie*) into 12 in., and each inch (*pouce*) into 12 lines (*lignes* or *points*). It is equivalent to 1.94903659 French meters, or to 6.3946 English feet.

TOKAT, a t. of Asia Minor, in the vilayet of Sivas, and 65 miles from the s. shore of the Black sea, stands at the mouth of a defile, on the banks of a small stream. It is inclosed by mountains on three sides, so that in summer the heat is intolerable. Gardens and vineyards extend along the slopes of the valley to the distance of 3 m. above the town. The town consists principally of wooden huts, disposed in narrow and dark streets. It was formerly a place of considerable trade, but its importance as a commercial mart has declined. Extensive copper furnaces, however, in which copper ore, brought from near Diarbekir, by means of mules and camels, is melted, still exist, and

give employment to many persons. Cotton-printing and dyeing are also carried on. Pop. about 10,000.

TOKAY, a species of wine obtained from the vines which grow on the Hegyallya mountains, a group stretching n. and n.e. of Tokay. The Tokay wine-district comprises about 15,000 English imperial acres, the produce from the Mezesmali, a detached rounded eminence near Tokay, being most esteemed. Great care is bestowed on the proper assortment of the grapes (which are never gathered until fully ripe): and also on the preparation of the wine—of which about 34 sorts are reckoned; but all of these may be grouped into the two classes of sweet and dry. The wine is brownish yellow while new, changing to a greenish hue as it grows older. The average annual produce of the Tokay vineyards is 1,500,000 imperial gallons of the dry, and 50,000 gallons of the sweet, wines. Tokay enjoys an immense reputation on the continent for its great restorative and tonic qualities; and so much is it esteemed in Hungary, that every considerable proprietor for miles round makes it a point to acquire some property in this vine-district, that he may be able to procure his wine from his own vineyards. On this account, genuine Tokay, is obtainable by wine-merchants only in small quantity (and this is especially the case with the more valuable sort, the sweet or imperial Tokay), and is largely mixed with inferior wines, to increase the amount. The vine-gathering is celebrated at Tokay, Maad, and Tallya, the three chief places of the district, as a national fête, to which the magnates of Hungary with their families flock from all quarters; and during the season of festivity, many times more than the whole value of the vintage is expended. The crowd of visitors is swelled largely by the wine-dealers and medical agents, who eagerly buy up such lots as are for sale, and sometimes give the most extravagant prices for imperial or other good qualities of wine. Large quantities of "imitation" Tokay are made by French and German chemists, and sent to all parts of Europe, not excepting Hungary itself, so that purchasers require to guard against imposition by dealing only with the grower or his accredited agent.

TOKEN, the name given to the kind of money which was at certain periods current in Britain by sufferance, and not by royal authority. Tokens first came into use in England in the reign of Henry VIII., in consequence of the want of any authorized coins to represent the fractions of a penny; and in the reign of Elizabeth, stamped tokens of lead, tin, and even leather, issued by vintners, grocers, and other tradesmen, passed largely from hand to hand, and were payable at the shops where they were issued. The corporations of Bristol, Oxford, and Worcester, had also their tokens. In 1613, a royal proclamation authorized lord Harrington to issue farthing tokens, and prohibited the use of private tokens under penalties. This prohibition was renewed by Charles I., who granted to the duchess of Richmond, sir Francis Crane, and others, the exclusive right of coining authorized farthings for seventeen years; but the farthings made by these patentees were the subject of much discontent, as they were greatly below the intrinsic value of the metal. In the face of these prohibitions, private tokens, principally of brass, continued to circulate, and were especially abundant during the civil war. Numerous tradesmen's tokens, mostly of copper, were again struck during the scarcity of money at the close of the last century. On account of the scarcity of current silver money, previous to the new coinage of 1817, silver pieces known as bank tokens, of the respective values of 5s., 3s. and 1s. 6d., were issued by the Bank of England; they were called in on the revision of the coinage.

TOKIO, or **YEDO** (pronounced Edo, "River-door"), since 1868 called **TOKIO** ("Eastern capital"), the capital of Japan, is situated in the e. of the mainland, at the head of the bay of the same name, in lat. 35° 40' n., and long. 139° 45' east. The river O-gawa, or Great river, divides it into an eastern and western portion, the latter being by far the larger and more important. For postal and general municipal purposes Tokio has of late years been divided into six great sections, each of which is subdivided into from eleven to fifteen districts. Five of these sections lie to the w. of the river O-gawa; the sixth, lying to the e., forms the most densely populated part of an extensive suburb, which is for the most part farm-land, but also contains a great number of large timber-yards, brick-kilns, etc., and is ramified by a vast network of canals. These canals also serve to join O-gawa with Naka-gawa, which latter river bounds the above-mentioned suburb to the e., and by which a great deal of produce is brought to the capital from the interior. The O-gawa is a large and rapid river, and is spanned by wide bridges, whose lengths range from 250 to 350 yards. In 1878, however, a return was made to the old district names, two of which, Honjo and Fuku-gawa, lie between O-gawa and Naka-gawa. Under the Shogun (mistakenly called Tycoon, see JAPAN), Tokio proper was divided into O-shiro, or the citadel; Soto-shiro, outside the citadel; and Michi or streets. In O-shiro was the palace of the Shoguns, which, repeatedly burned and rebuilt, was again destroyed by fire in 1872. But the beautiful large parks surrounding it are maintained in good order, and here it has been proposed to build a new palace for the mikado or emperor.

Soto-shiro which engirdles O-shiro, is partly occupied with palaces and temples; and the more eastern part of it is intersected by the Tokaido, the most important high-road through Japan. It also contains Dai-gaku, the modern imperial university, where native youths get a liberal education and college training for the professions of law, medicine,

engineering, and industrial chemistry; as also Kobu-dai-gakko, which is a special school for engineers. The grounds of the university comprise 10 acres. Near the university are the higher normal school and a number of elementary schools. One of its numberless bridges is called Nihon-bashi ("bridge of Japan"), and is considered the center of the empire, all geographical distances being reckoned from it. The third of the old divisions of the city forms the exterior part of the city, and contains among others the temple of K'wanon, the most venerated and frequented in all Japan; that of Confucius, which under the Shoguns was the national university for the study of Chinese literature, and is now converted into a public library of native, Chinese, and European books; and that of Kanda-Niyojin, the tutelary deity of the city. In this division also is Yoshiwara, the most popular of the five districts of Tokio set apart for prostitutes.

The population of Tokio was formerly much greater than it is now, because of the Shogun compelling every daimio, or clan-prince, to live in Tokio for a great portion of the year with a large body of retainers. This custom being, of course, extinct since the revolution of 1868, the population has diminished, being in 1894, 1,242,224. The area covered by the capital, however, is about 28 sq. m.; and therefore Tokio, in point of extent, ranks among the largest cities in the world. It is situated in a great plain, which extends n. and s. about 100 m., and from the coast to the mountains from 20 to 60 miles. This plain is one of the most fertile in Japan, and is tilled with great skill and laborious care, irrigation and manuring being adopted to the fullest possible extent. It is traversed by many large rivers, from one of which an abundant water supply is brought to Tokio, a distance of 40 miles. Smaller streams intersect the plain in every direction, and form rich and lovely valleys, the ridges between which rise at very few places to more than 200 ft. above sea-level. Tokio is connected with Yokohama by railway, and a large extent of telegraphic line now keeps it in close communication with the s., n., and w. of the empire. In recent years a very eager desire for the acquirement of European knowledge of science, industry, and political and social philosophy has been manifested by the people. The classes of the recently established colleges of the capital are crowded with enthusiastic and industrious students. Immense improvement has been made both in the lower and the higher education of the people. There are schools of agriculture, forestry, music, mechanic arts, and for the training of teachers, besides various charitable institutions. Although external evidences of superstition abound in Japan, nothing illustrates the small practical influence superstition has upon the daily actions and thoughts of the Japanese people more forcibly than the marvelously rapid progress that rational European *medical* science has made in Japan, not merely in the education of a large body of intelligent and well-qualified physicians and surgeons, but still more remarkably in the confidence and faith in the doctors of the new school displayed by the people at large.

The main body of the new imperial army is located and drilled in the capital. Its creation after the great revolution of 1868 was superintended by French officers. There is a large arsenal, well stocked with excellent modern machinery, in Tokio; and also a naval college where cadets for the marine service receive a good scientific education and practical training.

The city was founded in 1456 but did not become important till the Shoguns made it their residence in 1598. Much of the former glory of old Yedo has vanished, many stately palaces and rich temples having been burned to the ground, or allowed to fall into decay. But the chief natural beauties of the city remain—the 30 m. of tortuous moats, with their summer blaze of lotus flowers, and the exquisitely beautiful parks and gardens with their luxuriant flowers and rich wooding.

The city suffers from fire frequently. In 1858 a single fire destroyed fully one-quarter of the whole city; and in one night in 1876, 8000 houses were burned. In 1894 the city was visited by an earthquake. The whole business part of the city is studded with clay fire-proof storehouses, into which all the chief valuables are hurriedly thrust immediately upon the breaking out of a fire in the neighborhood. The massive iron doors and shutters of these fire-proof "dova" are as soon as the interior is filled, cemented air-tight. Lighted candles having been placed inside before the closing of the last door in order to exhaust the inflammable oxygen of the inclosed air, the building may be left to be raged round by the flames of a dozen burning houses crowded about it, and may even be raised to a red-heat without there being any danger of combustion taking place inside. The houses burned down, being of a light wooden construction, are rebuilt with what appears to a stranger incredible rapidity.

In Tokio, as in other important towns of Japan, the use of electricity for street and shop lighting is gradually extending. There are numerous papers (including a dozen dailies) and periodicals published in Tokio; but although many of them are cleverly edited, the press suffers severely from government censorship. Important industries are the manufacture of silk goods, enameled articles, porcelain, and, faience, and the city contains machine shops, and shipyards. The Ishi Kawajinna dock is 220 feet in length and 42 feet broad at the entrance. A considerable export trade in silk, silk-worms' eggs, copper, lacquer-work, mats, timber, etc., passes through Tokio, the goods being shipped at Yokohama. The bay of Tokio is shallow, permitting only small craft to approach the city at high tide. See Adam's *History of Japan*; Griffiths' *Mikado's Empire*; Aimé Humbert's *Japon Illustré*; Maurice Dubard's *Japon Pittoresque*; Sir Rutherford Alcock's *Capital of the Tycoon*; Oliphant's *Narrative of Lord Elgin's Mission*; *The Treaty Ports of China and Japan*; Mossman's *New Japan*; Dixon, *The Land of the Morning*; Satow and Hawes, *Handbook for Travelers in Central and Northern Japan*.

TOLAND, JOHN, a well-known deistical writer, of the 17th and 18th c., was b. near the village of Redcastle, in the co. of Londonderry, Ireland, Nov. 30, 1669 (or 1670). His parents were Roman Catholics, and he was brought up in that religion. His baptismal name was James Junius; but the ridicule which it drew upon him at school, led him to change it into John, by which he is now known. He was educated at Redcastle, and entered the university of Glasgow in 1687, but removed to that of Edinburgh, where he took the degree of master of arts in 1690. Thence he passed to Leyden, where (having abandoned at Edinburgh the Roman Catholic faith) he entered upon theological studies with a view to orders as a nonconformist minister. One of his masters at Leyden was the celebrated Spanheim. He remained there about two years, during which time he made the acquaintance of Leibnitz and some other distinguished men; and on his return to England, he resided for some time at Oxford, where his extravagant vanity, and the reckless boldness of his opinions on religion, drew on him much notice. In the Bodleian library, he collected the materials of more than one of his later publications, and prepared in great part the work entitled *Christianity not Mysterious*, which he published in London in 1696, and in which he fully avowed his unbelieving principles. The work created a great sensation in the theological world. It was censured by convocation, and led to several replies (among which, those of Payne and Stillingfleet may be specially noticed); and in the following year, Toland resolved to return to Ireland, sending before him a large number of copies of his work; but he was received no less unfavorably than in England, and his book was burned publicly by the common hangmen, in virtue of an express vote of the Irish parliament. Finding it necessary to flee from Ireland, Toland returned to London, where he published a defense against this judgment of the Irish parliament; but he soon afterward turned his pen from theological to political and literary subjects. A pamphlet entitled *Anglia Libera*, on the succession of the house of Brunswick, led to his being received with favor by the princess Sophia at the court of Hanover; and to his being sent on a kind of political mission to some of the German courts.

During his residence abroad, he published in 1702 a vindication of his book against the judgment of the convocation, the tone of which was considerably more moderate; but again, in 1705, he outstripped the boldness of his former opinions, and with still less of disguise, openly avowing himself a pantheist. In this course he was emboldened by the patronage of Harley, in whose service he had engaged as a political pamphleteer, and by whom he was sent abroad to Holland and Germany in 1707, in a capacity which, however he disavowed it, was plainly that of a political spy. He returned to England in 1710; and having forfeited the favor of his patron, or at least having separated from him, he engaged as a partisan pamphleteer on the side of Harley's adversaries.

His after-life was that of a literary adventurer, and was checkered by every variety of literary conflict and pecuniary struggle. It forms one of the most curious and painful chapters in Disraeli's *Calamities of Authors*. He resided from the year 1718 at Putney, where he died, Mar. 11, 1722, in his 52d or 53d year; and it is observed by Disraeli, that on his table was found an *Essay on Physics without Physicians*, which he was writing, in revenge for the unskillful treatment which he himself had suffered in his malady.

Of his works, which were very numerous, but have never been collected into a uniform edition, the following are the most remarkable: *Christianity not Mysterious: a treatise showing that there is nothing in the Gospel contrary to Reason, nor above it* (Lond. 1696); *Apology for Mr. Toland* (1697); *Life of Milton*, prefixed to Milton's works, 3 vols. folio (1698); *Anglia Libera, or the Limitation and Succession of the Crown explained and asserted* (1701); *Vindicus Liberius, or Mr. Toland's Defence of Himself against the Lower House of Convocation* (1702); *Socinianism truly stated* (1705); *Reasons for Naturalizing the Jews* (1714); *State Anatomy of Great Britain* (1714); *Nazarenus, or Jewish, Gentile, or Mahometan Christianity* (1718). A detailed account of these works would be out of place, but they all exhibit in a general way the characteristics described above. His posthumous works were published in 2 vols. 8vo, in 1726, with a life by Des Maizeaux. An *Account of Toland's Life and Writings*, ascribed to Curle, had previously appeared in 1722. It should be added that the above list is far from containing all the writings of this now little known, but once active and notorious polemic.

TOLEDO, city and co. seat of Lucas co., O.; on the Maumee river, the Miami and Erie canal, and the Ann Arbor, the Cincinnati, Hamilton, and Dayton, the Flint, and Pere Marquette, the Lake Shore and Michigan Southern, the Michigan Central, the Ohio Central system, the Wabash, and other railroads; 53 miles s.w. of Detroit. It is about 4 miles from the entrance of the river into Maumee bay, which is the w. extremity of lake Erie, and about 8 miles from the lake proper. It thus has exceptional facilities for trade by rail and water with a vast area of territory, and is in direct communication with all of the ports on the great lakes. The largest lake steamers can load and unload at its docks. The city in consequence is a great distributing point for all kinds of manufactures and produce, and is particularly noted as a soft coal and clover seed market. Toledo has a U. S. government building, an extensive state asylum for the insane on the separate cottage plan, co. court-house, Central high school, Ursuline convent, Smead school, medical college, Toledo hospital training school for nurses, public and other libraries, soldiers' memorial building, armory, and a large number of hospitals

and public and private charitable institutions. Public school property, which includes over 40 buildings used for public school purposes, has a value of over \$1,000,000; school population over 29,000; enrollment in public schools 15,000, and in private and parochial schools 4500; annual expenditure for public education over \$400,000. There are several public parks, nearly 100 churches, more than a dozen banking institutions, and many daily, weekly, and monthly periodicals. The U. S. census of 1890 reported for Toledo 734 manufacturing establishments, employing \$12,700,372 capital and 10,313 persons, paying \$5,214,443 for wages and \$12,189,924 for materials, and having a combined output valued at \$21,651,574. The principal manufactures are coffee and spice, malt liquors, flour and grist, carriages and wagons, foundry and machine shop products, lumber products, bicycles, and furniture. It also has large shipbuilding interests. Toledo is the port of delivery for the Miami customs district, and in the fiscal year 1896-7 had imports of merchandise valued at \$354,865, and exports \$752,049. The net bonded debt exceeded \$5,000,000, including a water debt of over \$1,000,000; the city owned the waterworks, which originally cost \$1,000,000; and the total assessed property valuation was over \$47,500,000. Pop. '90, 81,434.

TOLEDO, a famous city of Spain, capital of the province of the same name, and long the capital of the whole country, stands on the n. bank of the Tagus, by which it is encompassed on three sides, 41 m. s. s. w. of Madrid by railway. It is situated on a number of hills at the height of about 2,400 feet above sea-level; and the climate, excessively hot in summer, is bitterly cold in winter. The Tagus is the great fortress of the town. Rushing round it, on the e., s., and w., between high and rocky banks, it leaves only one approach on the land-side, which is defended by an inner and an outer wall, the former built by the Gothic king Wamba, in the 7th c.; the latter by Alfonso VI. in 1109, and both remarkable for the number and beauty of their towers and gates. Seen from a distance, the city has a most imposing appearance; within, it is gloomy, silent, inert, and its narrow streets are irregular, ill-paved, and steep. In the middle of the city rises the lofty, massive cathedral, surrounded by numerous churches and convents, mostly deserted, for here the churches are without congregations, and the streets and walks are almost destitute of people. The cathedral, completed in 1492, and built on the site of a former mosque, is a large edifice, in simple, pointed Gothic. It was ransacked and plundered in 1521 and 1808, but previous to these events, its interior was of the most magnificent description. The stained glass that remains is superb; the choir is a perfect museum of high-class sculpture; and there are two pulpits of metal, gilt, the workmanship of which is as fine as that of the richest plate. The cathedral is 404 ft. long, and 204 ft. wide; and has 5 naves, supported on 84 piers. Besides the cathedral there are 26 other churches, and 37 monasteries of great interest, alike from their architectural beauty, their decorations, and their historical associations. The Zocodover, "square market," thoroughly Moorish in its architectural character, is a fashionable promenade, and was for years the site on which heretics were burned, and bull-fights took place. The *Fabrica de Armas*, or manufactory of Toledan swords, a huge, rectangular, unsightly building, standing on the right bank of the Tagus, was erected in 1788, though long before that time the Toledan blades had become famous, and the fondness of the Iberians for their weapons, as well as the weapons themselves, were written about both by Livy and Polybius. The temper of the best Toledan blades is such, "that they are sometimes packed up in boxes, curled up like the mainspring of a watch." The buildings of the town also include a theological seminary, military school, female college, hospitals, and manufactories of coarse woollens, paper, guitar-strings, and leather. Pop. '45, 13,431; '87, 20,837.

Toledo, the *Toletum* of the Romans, is of very early origin, and was taken by Marius Fulvius in 193 B.C. It was the capital of the Goths during their dominion; in 714 it fell into the possession of the Moors, who retained it till 1085, when it was permanently annexed to the crown of Castile. In the days of its highest prosperity, it is said to have contained 200,000 inhabitants.

TOLEDO WAR, a controversy between the state of Ohio and the then territory of Michigan, which arose in 1835 from questions as to boundary. Congress in the ordinance of 1787 had reserved the right to form new states out of the part of territory n. w. of the Ohio river "lying n. of an e. and w. line drawn through the southerly bend or extreme of lake Michigan." Ohio was admitted as a state in 1802, the above line being described in the act as its n. boundary, though the state constitution claimed more territory. The true latitude of the bend was not given in Mitchell's map, and when in 1805 Michigan territory was organized, and, later, Indiana and Illinois became states, the most confused ideas existed on the boundary question. A survey was made by order of congress in 1817 which established the present line. The old line had included in Michigan the city of Toledo, and this was the main point in dispute. In 1835 Ohio laid claim to all within the new or Harris line, and proceeded to organize townships. Michigan declared the intention of resisting such invasion, and the militia of both sides was called upon to maintain the alleged rights of their respective governments. An opinion of the U. S. attorney-general, B. F. Butler, favored Michigan; President Jackson sent out a "peace commission" with no result, and serious conflict seemed imminent. In Sept., 1835, the Michigan troops occupied Toledo to prevent the formal organization of

Wood co. by Ohio officers. The latter, however, accomplished their purpose secretly and withdrew. The trouble was finally settled by the admission of Michigan into the union on condition of accepting the Harris line, while as a make-weight that state was given the upper Wisconsin peninsula, which afterward proved from its mineral wealth to be far more valuable than the disputed territory.

TOLENTINO, *Tolentinum*, a town of central Italy, province of Macerata, 11 m. s.w. of Macerata, on a rising ground, left bank of the Chienti. It has a fine cathedral dedicated to St. Nicholas, and a town hall with ancient inscriptions, a statue of Agrippina, and several good paintings. Tolentino has been a bishop's see from the 5th century. In the Parisani palace at Tolentino Pius VI. signed a treaty with Bonaparte in 1797, by which the pope ceded Bologna, Ferrara, and the Romagna to the cisalpine republic. Under the French empire, it formed part of the department of Musone. Here Murat was defeated by the Austrians, 1815. Pop. '81, 4114.

TOLERATION is the liberty which, in some countries where a particular form of religion is established by law, is allowed to nonconformists to publicly teach and defend their theological and ecclesiastical opinions, and to worship whom and how they please, or not at all. But no permission is thereby given to violate the rights of others, or to infringe laws designed for the protection of decency, morality, and good order, or for the security of the governing power. The enforcement of this class of laws, which have merely civil and political objects in view, is indispensable to the public welfare, and must proceed without regard to the notions of religious duty which their contraveners may entertain or profess. In Britain, there are still in force certain statutes imposing penalties on opinions and practices generally regarded as impious, and which were thought to be criminal because of their offensiveness to God (see **BLASPHEMY**); but these laws are seldom executed now, the opinion having become prevalent, that, except when the religious feelings of the public are so wantonly outraged as to make the perpetrator a nuisance, theological error is best opposed by refuting it, and that when those accused of heresy (q.v.) are men of piety and earnest conviction, any degree of severity short of extirpation tends rather to diffuse than to suppress their tenets. Besides, the right of private judgment in matters of faith and worship is now more generally recognized *in practice* than it used to be, though such is human pride that even yet many resent the exercise, by their neighbors who differ from them, of the freedom which they claim for themselves. They seem to forget the maxim that we should do to others as we would have others to do to us—a principle admirably applied by St. Paul to the case of religious differences (Rom. xiv.), and which indeed is the only one that has been found to work well in all circumstances for every sect; it condemns not only political disabilities and restraints unwarranted by the exigencies of the state, but still more, that uncharitable treatment through which, almost exclusively, the spirit of intolerance can now find a vent in free Protestant countries. Were it not for the inconsistency thus displayed in our own day by many professing advocates of the right of private judgment, it might seem wonderful that the Reformers, by whom that right was first asserted, and who on no other ground could justify their separation from the church of Rome, became in their turn the persecutors, not only of the Romanists, who had persecuted them, but of such fellow-Protestants as had drawn from Scripture conclusions that differed from their own. Instances of such inconsistency on the part of the Reformers and their successors will be found in the articles CALVIN, SERVETUS, SOCINUS, BIDDLE, and JEWS. In a church claiming infallibility (q.v.), and believing that salvation is unattainable beyond her pale, it is not only consistent, but to her most earnest members must seem a duty, to prevent by force the spread of what is accounted a fatal heresy; and, in fact, toleration has never been either professed or practiced by the church of Rome. See ALBIGENSES, WALDENSES, DOMINICANS, INQUISITION, HUGUENOTS, BARTHOLOMEW'S (ST) DAY, NANTES (EDICT OF), CEVENNES, DRAGONNADES. But even the Puritans (q.v.), though long oppressed themselves, were so blind to the right of others to differ from them, that in their own brief day of power they eagerly repudiated, by word and deed, as a monstrous and impious error, the principle of a universal toleration. In the assembly of divines (q.v.) held at Westminster in 1643-46, the Presbyterian members fought successfully against the proposal of the Independents that all sects should alike be tolerated. "We hope," wrote Baillie to his Presbyterian friends in Scotland, "that God will assist us to remonstrate the wickedness of such a toleration. . . . For this point, both they and we contend *tantum pro aris et focis*" (Baillie's *Letters*, ii. 328, 350; Bannatyne club ed.: see also the strong expressions of George Gillespie, another member of the assembly, in his *Propositions concerning the Ministry and Government of the Church*, prop. 41 and 42). We accordingly find in the 23d chapter of the *Westminster Confession* an assertion of the duty of the magistrate to promote the true religion, and to restrain and punish heterodoxy—a principle which, soon after the restoration, was found to work very inconveniently for the Presbyterians themselves, the magistrate being then one who differed from them as to what the true religion was. The Independents, on the other hand, had learned the lesson of toleration in Holland—that nursery of liberty in modern Europe—whither they had fled from oppression in the reign of James I.; and it is a mistake to suppose, as some have done, that they were the first to understand and practice the principles of religious freedom. In the 16th c., Zuinglius and the Hunga-

rian reformer Dudith, disclaimed, by word and action alike, the notion that any man is entitled to assume, in his dealings with others, that his own interpretations of Scripture are true, and those of other men, if different, false and culpable. "You contend," wrote Dudith to Beza, "that Scripture is a perfect rule of faith and practice. But you are all divided about the sense of Scripture, and you have not settled who shall be judge. You say one thing; your opponent, Stancarus, says another. You quote Scripture; he quotes Scripture. You reason; he reasons. You require me to believe you: I respect you; but why should I trust you rather than Stancarus? You say he is a heretic; but the papists say you are both heretics. Shall I believe them? . . . You say that your lay hearers, the magistrates, and not you, are to be blamed, for it is they who banish and burn for heresy. I know you make this excuse; but tell me, have not you instilled such principles into their ears? . . . Do you not daily teach that they who appeal from your confessions to Scripture ought to be punished by the secular power? . . . When you talk of your Augsburg confession, and your Helvetic creed, and your unanimity, and your fundamental truths, I keep thinking of the sixth commandment—'Thou shalt not kill.'" In the history of England, also, from the Reformation to the Commonwealth, there is, as Bishop Heber has observed, "abundant proof that (much as every religious party, in its turn, had suffered from persecution, and loudly and bitterly as each had, in its own particular instance, complained of the severities exercised against its members) no party had yet been found to perceive the great wickedness of persecution in the abstract, or the moral unfitness of temporal punishment as an engine of religious controversy. Even the sects who were themselves under oppression exclaimed against their rulers, not as being persecutors at all, but as persecuting those who professed the truth; and each sect, as it obtained the power to wield the secular weapon, esteemed it also a duty, as well as a privilege, not to bear the sword in vain."—*Life of Jeremy Taylor*, p. 27. It is chiefly to the many keen discussions in Holland and England during the century which followed the restoration (aided, no doubt, by that moderation or indifference which characterized the Protestant churches a hundred years ago—by the ever-increasing number and power of the dissenters—and by that wider mental culture which enables men not only to see that diversity of mental gifts and acquirements naturally leads to diversity of opinion, but, in Cromwell's language, to "think it possible they may be mistaken"), that we must ascribe the tolerant spirit now actuating most of the statesmen of England and the United States, and which has lately made rapid progress among the people at large. Not only is the right of free thought and discussion now generally recognized, but its necessity to the well-being of mankind is asserted by eminent thinkers. Mr. John Stuart Mill, in his able treatise *On Liberty*, thus sums up the grounds on which the necessity of such freedom is affirmed by him: "(1) If any opinion is compelled to silence, that opinion may, for aught we can certainly know, be true. To deny this, is to assume our own infallibility. (2) Though the silenced opinion be an error, it may, and very commonly does, contain a portion of truth; and since the general or prevailing opinion on any subject is rarely or never the whole truth, it is only by the collision of adverse opinions that the remainder of the truth has any chance of being supplied. (3) Even if the received opinion be not only true, but the whole truth; unless it is suffered to be, and actually is, vigorously and earnestly contested, it will, by most of those who receive it, be held in the manner of a prejudice, with little comprehension or feeling of its rational grounds. And not only this, but (4) the meaning of the doctrine itself will be in danger of being lost, or enfeebled, and deprived of its vital effect on the character and conduct; the dogma becoming a mere formal profession, inefficacious for good, but cumbering the ground, and preventing the growth of any real and heartfelt conviction, from reason or personal experience" (p. 95).

See Jeremy Taylor's *Liberty of Prophesying*; Milton's *Areopagitica*, his *Treatise of Civil Power in Ecclesiastical Causes*, and his treatise *Of True Religion, Heresy, Schism, Toleration, etc.*; Dr. John Owen's *Indulgence and Toleration Considered*; Barclay's *Apology for the Quakers*, prop. 14; Locke's *Letters concerning Toleration*, and treatise *On the Conduct of the Understanding*; bishop Hoadly's *Sermons, and Dedication to Pope Clement XI.*; Ibbot's *Boyle Lectures on the Right Duty, Benefits, and Advantages of Private Judgment*; Paley's *Moral Philosophy*, b. 6, ch. 10; Sydney Smith's *Letter to the Electors on the Catholic Question*; D'Israeli's *Curiosities of Literature*, article "Toleration"; Hallam's *Literature of Europe* (Part iii. ch. 2); Whately's *Essays on the Errors of Romanism, etc.*; J. Blanco White *On Heresy and Orthodoxy*; Brook's *History of Religious Liberty*; James Martineau's *Rationale of Religious Inquiry*; Samuel Bailey's *Essay on the Formation of Opinions, and On the Pursuit of Truth*; Taylor's *Retrospect of the Religious Life of England*; Edgar Taylor's *Book of Rights or Constitutional Rights and Parliamentary Proceedings affecting Civil and Religious Liberty in England, from Magna Charta to the Present Time*; and *The Edinburgh Review*, vol. 76, p. 412.—In regard to the manner in which the early Christians became liable to punishment under the Roman laws, see Neander's *History of the Christian Religion and Church*, vol. i. p. 118, Bohn's ed.; Gibbon's *Decline and Fall of the Roman Empire*, ch. 16, compared with ch. 2; Dr. Taylor's *Elements of Civil Law*, App.; and the articles ANTONINUS (MARCUS AURELIUS), DECIUS, and PERSECUTIONS, in the present work.

TOLL (Gr. *telos*, a public tax; Gr. *telonion*, Lat. *telonium*, a toll-house; Ang.-Sax. *tol*, Ger. *zoll*, seem related to the root Ger. *zahl*, Eng. *tell*, to count, to pay), a payment exacted under a royal grant, or some prescriptive usage, or by express statute; such as by the owner of a port for goods landed or shipped, by the owner of a market or fair for articles sold, or by those charged with the maintenance of roads, streets, bridges, etc., for the passage of persons, goods, or cattle. It is essential in a toll that it be for some reasonable consideration; otherwise, it is void. In modern times, the right to take toll is always created by statute, and nothing short of statutory authority will authorize its levy, for it is a species of tax.

Many tolls receive special names, as dues, customs, etc.; and the term toll is now mostly used in connection with turnpike roads (so called from the turnpike or gate turning on an upright axis or pike, at which the tolls are collected) and bridges. See HIGHWAY.

TOLLAND, a co. in n.e. Connecticut, drained by the Willimantic and other small rivers, traversed by the New England and the Central Vermont railroads; about 403 sq. m.; pop. '90, 25,081, chiefly of American birth. The surface is diversified and fairly fertile. Tobacco and corn are raised, and the butter is noted for its excellence. Co. seat, Tolland.

TOLLENS, HENDRIK CAROLUSZON, a popular modern Dutch poet, born at Rotterdam, Sept. 24, 1780. At the early age of 14, his father, a merchant in dyestuffs, placed him in his counting-house, and first looked favorably upon, but afterward discouraged the boy's poetical efforts. The sympathies of young Tollens were at that time with what was called the patriotic party, who thought that the entrance of the French, in 1795, would be the cure for all political evils, and he made many verses in the spirit of the times. In his 17th year, he began to study English, German, and Latin; but French literature was his favorite study, and translations of French tragedies his chief work. At 19, he published translations from the French poets, under the title of *A Nosegay of Fragrant Flowers culled on French Ground*. Three years later, appeared his *New Songs and Idyls*, in which he first came out as an original poet. Shortly after, followed another collection of miscellaneous poems, which showed more marked progress; in 1805, his tragedy of *Lucretia*; and in 1806, that of the *Hoekschen and Kabeljaavroschen*, or the contest between the nobility and the towns in Holland, in the olden time—both original pieces of great merit. In 1804 Loots carried off the first prize, and Tollens the second, for a poem on Hugo de Groot; and in 1806, the order was reversed, when both again sung the deaths of counts Egmont and Hoorn. There flowed from his pen an uninterrupted series of songs and poems, in which the warmest feelings were expressed in the most natural and chaste language. Of these may be mentioned, as a few gems, "William I.," the "Victory at Nieuwpoort," the "Four Days' Naval Fight," the "Cry to Arms in 1815," the "Wintering of the Dutch in Nova Zembla," and the "National Song of the Netherlands," which is an echo of the calm but patriotic spirit of the people. His deep fellow-feeling with his countrymen is seen in the poems which he wrote during the Belgian revolution in 1830-31, as in the heart-stirring poems, "The Evening Prayer," and "The General Prayer-day." The popularity which Tollens attained, his poems reaching the fifth edition in 1831, arose chiefly from his singing of subjects always dear to the heart of the nation—of family-life, country, religion, and love—and that in simple, unartistic language, and pure Dutch style. The people loved the poet because they understood him, and his words touched their hearts. Tollens published *Romances, Ballads, and Legends*, (1818); *New Poems* (1821-29); *Songs of Claudius* (1832); *Poetical Flowers gathered from Neighboring Nations* (1839); *Scattered Poems* (1840); two volumes (1850), in which, though advanced in life, the tone of his lyre was more beautiful, powerful, and rich than ever. Tollens died at Rijswijk, Oct. 21, 1856.

Of modern Dutch poets, Tollens stands in the first rank. The wintering in Nova Zembla is the most wonderful piece of descriptive poetry in the Dutch language. Tollens was an excellent man, distinguished for his sincere piety and benevolence. His compassion for the poor comes out in his *Bedelbrief*, or begging-letter, which he published for the benefit of the distressed in the severe winter of 1844-45. While the people's poet, he was also God's priest for spreading Christian love among men. In early life, Tollens belonged to the Roman Catholic church, and in 1827 joined the Protestant Remonstrants; but both before and after the change, he was essentially a religious man.

TOLOSA, a t. in the n. of Spain, capital of the province of Guipuscoa, 25 m. n.w. of Pamplona. It stands in a deep valley watered by two streams, and abounds in old family mansions. There is a royal factory for arms, and in the vicinity are zinc and lead mines. Pop. '87, 7223.

TOLSTOI, LYOF OR LEO NIKOLAJEVITCH, count; b. Yasnaya Polyana, government of Tula, Russia, Sept. 9 (n.s.), 1828; author and social reformer. He entered the university of Kazan, but did not complete his studies, and in 1851, having visited the Caucasus, joined the army, becoming a captain, and distinguishing himself at the siege of Sevastopol. In 1854 he resigned, and after residing for a time in Moscow and St. Petersburg and traveling twice in Europe, retired to his country estate in 1861, the year before his marriage, and has since made it his permanent home. His writings fall into three well-defined periods. To the first belong *Childhood* (1852), and its sequels *Boyhood* (1854), and *Youth* (1855-57); *The Cossacks* (1854); *Sevastopol* (1855); and other military sketches.

To the second belong his two great novels, *War and Peace* (1865-68), and *Anna Karenina* (1873-76). Soon after this he underwent a remarkable change of character, becoming imbued with mystical religious and philanthropic ideas, and formulated a creed based on a communistic interpretation of scripture, and has since, as farmer, school-teacher, etc., adopted the life and habits of the peasantry, and promulgated his religious ideas so successfully that a numerous sect called "Shalaputui" (the Extravagants) has arisen. His doctrines are amply set forth in his works, *My Religion*, *My Confession*, a *Commentary on the Gospels*, and *Work While Ye Have Light*. His theory of marriage is set forth in his *Kreutzer Sonata* (1888). See REALISM AND NATURALISM.

TOLTECS or **TULHUATECAS**, a Mexican nation, who, according to Mexican tradition came from some other country to Anahuac in the 7th c., and established the kingdom of Tula. They were followed by the Chicimecs, by the Nahuatl tribes, and last of all by the Mexicans. The Toltecs, who are represented as the first civilized people in Mexico, were of the same race as the Nahuatl tribes. Their numbers were thinned by pestilence, and in the 11th c. wars between the nobility and clergy destroyed the Toltec kingdom. Many of the Toltecs removed to Guatemala, where they founded another monarchy; and the Quichés derived their ancestry from them. The Toltecs remaining in Mexico were incorporated with the Chicimecs, who were of a different race.

TOLU. See BALSAM.

TOLUCA, a t. of Mexico, capital of the state, and 32 m. w.s.w. of the city of Mexico, about 8800 ft. above the sea. Pop. '95, 23,648. Near the town is the volcano of the same name.

TOMAHAWK, a light war-hatchet of the North American Indians. The early ones were rudely made of stone, ingeniously fastened to their handles by animal sinews, or cords of skins. European traders supplied hatchets of steel, the heads of which were made hollow, for a tobacco-pipe; the handle of ash, with the pith removed, being the stem. These hatchets are used in the chase and in battle, not only in close combat, but by being thrown with a wonderful skill, so as always to strike the object aimed at with the edge of the instrument. The handles are curiously ornamented.

TOMATO or **LOVE-APPLE**, *Lycopersicum esculentum*, a plant of the natural order *solanaceæ*, formerly ranked in the genus *solanum*, and known as *S. lycopersicum*. The genus *lycopersicum* is distinguished by a 5-6-parted calyx, a wheel-shaped 5-6-cleft corolla, 5 stamens, and a 2-3 celled berry, with hairy seeds. The tomato is an annual, from 2 to 6 ft. in height, requiring support when tall. The leaves are unequally pinnate, the leaflets cut; the flowers numerous, followed by berries, which are very various in shape and color—generally red and yellow—in different varieties. The plant is a native of the tropical parts of America, but is now much cultivated in all parts of the world suitable for it, as the s. of Europe and the United States.

TOMB (Gr. *tymbos*), a monument erected over a grave, in order to mark the resting-place, and preserve the memory of the deceased. In early ages, and among eastern nations, it sometimes became the practice to place the remains of the dead in excavated sepulchers, whose interior was often decorated with painting or otherwise. Where the usage was to burn the dead, their bones and ashes were placed in urns in these receptacles. Some of the most remarkable rock-tombs were those of Egypt, belonging to the 18th and following dynasty of the Theban kings. The monarch's burial-place began to be excavated as soon as he ascended the throne, and the excavation went on year by year, the painting and decoration progressing till the king's death, when it was suddenly broken off, the tomb thus becoming an index both of the king's magnificence and of the length of his reign. The most costly articles are often found in these sepulchers. The decoration was almost entirely reserved for their interiors, the façades being comparatively unobtrusive. On the other hand, the rock-tombs of Persia and Lycia, less rich and elaborate internally, have imposing architectural façades, those of the Persian kings being copied from their palaces; and during the Roman period, this species of magnificence prevailed at Petra (q.v.) to an extent that gives that now deserted valley the aspect of a city of the dead. See also ETRURIA.

Tombs, in more modern times, have generally been mounds or masses of building raised over the remains of the dead. In the Homeric poems, heaps of cairns of stones are placed as honorary memorials above the graves of departed heroes. The sepulchral mound (q.v.) or tumulus of rude ages is found over the greater part of northern Europe, and is probably older than the subterranean tomb. The pyramids (q.v.) were the sepulchers of the Egyptian monarchs from the 4th to the 12th dynasty. The tombs of Greece, and still more those of the Greek colonies in Asia Minor, were sometimes pillars, or upright stone tablets, sometimes small buildings in the form of temples. The most celebrated was the *mausoleum* (q.v.). The Roman tombs were not unfrequently important architectural structures, varying in form, but oftenest consisting of a circular tower resting on a square basement; familiar examples being the tomb of Cæcilia Metella, and the yet larger and more solid tomb of Hadrian, on the banks of the Tiber, best known as the Castel St. Angelo, which is about 220 ft. in height, and of immense solidity. In Rome, Latium, and Magna Græcia, tombs were generally erected outside the towns, and

along the principal roads leading into the country, as in the Via Appa at Rome, and the street of tombs at Pompeii. A form of excavated tomb, without external architecture, called *columbarium* (q.v.) was also in use in Rome, whose walls were pierced with cells to receive cinerary urns. The prevalent circular tomb became in the later period of the Roman empire polygonal; and the central chamber, at first small, was gradually increased, till, in the age of Constantine, it became something like a miniature representation of the Pantheon, generally with a crypt below the principal apartment.

In the earlier centuries of Christianity, the burial of the dead in churches was prohibited. The first step which led to its adoption was the custom of erecting churches over the graves of martyrs; then followed the permission to kings and emperors to be buried in the church porch. The most important tombs of the middle ages are generally within churches or cloisters. There is much variety in the form and enrichment of mediæval tombs. The earlier examples consists of a single stone coffin, or sarcophagus, often with a low gabled lid and sculptured cross. An altar-tomb, or tomb in the form of a table, followed; and in the 13th c., a species of tomb was introduced, consisting of a sarcophagus, on which rests a recumbent figure of the deceased, the whole being surmounted by a canopy, often of exquisite symmetry and richness. In the renaissance period of art, the tombs became more and more complex. The sarcophagus was disguised, or made the least important part of the monument; the representation of the deceased was confined to a medallion likeness, and the most prominent part of the tomb was composed of sculptured upholstery, and groups of symbolical and eventually mythological figures. In some of the 16th c. examples, as Michael Angelo's tombs of Giuliano and Lorenzo di Medici, at Florence, the inappropriateness of the design is partly redeemed by the beauty of the figures.

TOMBAC, or **WHITE-COPPER**, is an alloy formed of about 75 parts of copper and 25 parts of arsenic; it is used in the manufacture of buttons, and is a very beautiful metal.

TOMBIGBEE RIVER, one of the streams which unite to form the Mobile river; rises in Tishomingo co., Mississippi; flows through Mississippi and Alabama in a general s.e. course, about 450 m., and joins the Alabama about 45 m. above Mobile.

TOMBSTONE, city and co. seat of Cochise co., Ariz., 76 m. s.e. of Tucson. It is about 9 miles e. of the San Pedro river, and about the same distance s.e. of Fairbank (the nearest railroad station 1897), on the Arizona and southeastern and the New Mexico and Arizona railroads. The city has an excellent public school, a co. hospital for both pay and needy patients, gas lights, waterworks supplied from the Huachuca mountains, and several churches and newspapers. The principal industries are silver mining, general merchandizing, and freighting. It has an exceptionally salubrious climate. Pop. '90, 1875.

TOMCOD, a common name in the United States for the species of the genus *microgadus*, having the general external characteristics of the common cod-fish; three dorsal and two anal fins, a barbel on the chin, and teeth on the vomer. The species on the Atlantic coast is *M. tomcodus*; on the Pacific, *M. proximus*. They are brought to some of the markets, but are not highly esteemed.

TOM GREEN, a co. in s.w. Texas, formed in 1875, including Bexar district, having New Mexico on the n.w. and the river Pecos on the w. and s.w. The surface is mountainous. Pop. '90, 5152. Area, 3548 sq. m. Co. seat, San Angelo.

TOMMASE'O, **NICOLA'**, 1802-74; b. Dalmatia; resided for some time in Florence, was exiled to France in 1833, and removed to Venice in 1838. During the revolutionary movement of 1848, he was arrested, but was soon released by the people, and became minister of public worship and education. After the Austrians resumed control in 1849, he was again exiled, and the rest of his life was spent at Corfu, Turin, and Florence. Among his works are a dictionary of Italian synonyms; *Canti Popolari* (1841); *Studi Critici* (1843); and *Poesie* (1872).

TOMMY ATKINS is a facetious, generic name applied to the British soldier, and brought into notice by Rudyard Kipling (q.v.), who writes of him as a separate human whole, instead of the thousandth part of a regiment.

TOMPKINS, a co. in s.w. central New York, drained by Fall, Salmon, and other creeks; traversed by the Southern Central and other railroads; 494 sq.m.; including part of Cayuga lake; pop. '90, 32,923. Co. seat, Ithaca.

TOMPKINS, **DANIEL D.**, 1774-1825; b. N. Y.; graduated Columbia college, 1795; admitted to the bar in New York, 1796; a member of the legislature and of the state constitutional convention, 1801; member of congress from New York city, 1804; resigning to become a judge of the state supreme court; governor of New York, 1807-17; vice-president of the United States, 1817-25; delegate to the state constitutional convention, 1821. He supported the national government in the war of 1812, and commanded the third military district, contributing much by furnishing troops to the national success. In a message to the legislature, 1817, he recommended the total abolition of slavery in the state of New York, and an act was passed to take effect July 4, 1827.

TOMSK, a government of western Siberia, bounded on the e. and n.e. by the government of Enisei or Yeneseisk, and on the n.w. and w. by that of Tobolsk. Area, 331,159 sq. m.; pop. '94, 1,442,681. Tomsk, more than any other government of Siberia, abounds in lakes and rivers. Of the latter, most of which flow northward from the foot of the Altai mountains, the principal are the Ob, Tom, Chulim, and Irtysh. The largest lakes,

which are both sweet and brackish, occur in the Barabinsky steppes. The climate is mild in the middle and southern districts, but severe in the north. Sandy and clayey soils prevail; but there are patches of good mold on which abundant crops of grain of various kinds, as well as hemp, flax, rye, barley, and oats, are raised. The extensive mountain slopes and plains are covered with luxuriant forests, in which the most common trees are the broad-leaved oak, the cedar, and the pitch-tree. The natural products of the country are numerous. In the s. and e. parts, droves of wild horses and herds of horned cattle are a source of considerable wealth. But the mineral products of the country are its chief source of riches. Manufactures are not extensively carried on; there is a large barter-trade with Russia and China, and the commerce of the country is maintained for the most part by means of fairs.

TOMSK, a trading t. of Siberia, capital of the government of the same name, on the Tom, a tributary of the Ob, 2809 m. e. of St. Petersburg, in lat. $56^{\circ} 29'$ n., and long. $84^{\circ} 58'$ east. Situated on the great trading highway of Siberia, it is the seat of an important transit trade, chiefly with the Kalmucks and Mongols; but the goods that pass to and from Irkutsk also go by way of this town. There are manufactures of soap, leather, and distilled liquors, and there is an active trade in furs, grain, and cattle. It is said to be the richest town in Siberia; and its commercial importance, its extent, and the number of its handsome buildings are increasing annually. The Siberian university was opened at T. in 1886. Pop. in '97, 52,430.

TOM THUMB. See STRATTON, CHARLES HEYWOOD.

TON, a suffix of frequent occurrence in the names of Anglo-Saxon settlements. It seems to be from the same root as the Gothic *tains*, meaning a twig (allied to which are the *tine* of a fork, the *tines* of a stag's horns, the *tines* of a harrow) the Anglo-Saxon *tynan*, to hedge, and the Ger. *zaun*, a hedge. "Hence, a *tun* or *ton* was a place surrounded by a hedge, or rudely fortified by a palisade. Originally, it meant only a single homestead or farm, and this use of it is still common in Scotland. In modern English, in the form of *town*, it is applied to a collection of houses. Similarly with *ton*, the terminations *worth*, *fold*, *garth*, *burgh*, and others also convey the notion of inclosure, protection."—See I. Taylor's *Words and Places*.

TON, the same word as *tun* (q.v.), denotes a weight of 20 hundred-weight (*cwt.*). In Britain, the hundred-weight contains 112 lbs., so that the ton contains 2240 lbs. In the United States the hundred-weight is usually reckoned at 100 lbs., and the ton at 2000 lbs. In both countries, 40 cubic ft. of rough or 50 of hewn timber constitute a ton or load of the same. The hundred-weight (*centner*) in Austria, Prussia, Denmark, Germany, and Switzerland, contains 100 lbs.; in Hamburg, 112; in Bremen, 116; its representative in France, Spain, and Portugal, is the quintal (q.v.); in Italy, the *centinajo*; in Turkey, Egypt, n. Africa, and the Balearic isles, the *kantar* (124 lbs.).

STONE, in music, the name given to the larger intervals in the diatonic scale, so called in contradistinction to the *semitones* (q.v.), or smaller intervals. Theoretically, some of the intervals called tones are larger than others, and none of them are equal to two semitones; thus, in the scale of C, the intervals CD, FG, and AB, are all equal; but DE and GA, which are also called tones, are smaller; and the semitones, EF and BC, are larger than half even of the larger tones. In instruments, however, which are tuned according to the equal temperament (see TEMPERAMENT), all the tones are made equal, and each equivalent to two semitones.

STONE, THEOBALD WOLFE, 1763–98; b. Dublin; graduate of Trinity college, Dublin; called to the bar in London, 1789. He belonged to the whig party and wrote a number of political pamphlets. He was a Roman Catholic and endeavored to influence members of that church to unite with dissenters against the government, and published, 1791, *An Argument on behalf of the Catholics of Ireland*. He was one of the founders of the first club of United Irishmen at Belfast, and similar organizations in other parts of Ireland; sec. and agent of the Roman Catholic committee, 1792; implicated in Jackson's proceedings, but allowed to go at large, and came to this country in 1795. In the following year he went to France for assistance and returned suddenly to Ireland, recalled by rumors of a revolt. In the expedition to Bantry Bay he was adjt. gen. to the commander, Hoche, but the fleet was driven off the coast and scattered, thus discouraging the French, who abandoned the enterprise. In 1798 he set sail for Ireland with Moreau's army, and was defeated by an English fleet, taken prisoner, court-martialed, and having been sentenced to be hanged, cut his throat with a pen-knife to preclude the event.

TONGA BAY, a small inlet on the e. coast of Africa, bounded on the n. by cape Delgado, and extending inland in a n. direction. Cocoa-nut trees and jungle line the shores of the bay, and at its head is the village of Tonga, small and insignificant, but important from its frontier position. Cape Delgado is the northern limit of the Portuguese colonial possession of Mozambique; and the village of Tonga, which is situated n. of the parallel of lat. of the cape, is in the possession of the Seyyid of Zanzibar, and is the most southern possession of that sovereign.—*Despatches from Her Britannic Majesty's Consul and Political Agent, Zanzibar*, 1863.

TONGA ISLANDS AND TONGATABU. See FRIENDLY ISLANDS.

TONGRES, a very ancient city of Belgium, in the province of Limbourg, 13 m. s.s.e. of Hasselt. Its church of Notre Dame, the first dedicated to the Virgin n. of the Alps, dates from 1240; and the cloister attached, the oldest in the country, was built in the 10th century. The mineral spring in the vicinity, of which Pliny wrote. "*Purgatio corpora tertianas febres discutit, calculorumque vitia*," still retains its ancient virtues. Various manufactures are carried on. Pop. '94, 8823.

TONGUE, **TIE**, is a symmetrical muscular organ, extending from the hyoid bone backward and downward, to the lips in front, and occupying the buccal cavity. The superior surface, borders, and anterior third of the inferior surface are free; while the remaining parts are attached to adjacent parts by the investing mucous membrane and subjacent structures. At certain points, this membrane, on leaving the tongue, forms distinct folds, containing fibrous or muscular tissue, which act to a certain extent as ligaments to the tongue. The most considerable of these folds is termed the *frænum* (or bridle) of the tongue, and connects its anterior free extremity with the lower jaw. It acts as a strong ligament, and limits the backward movement of the tip of the tongue. In rare cases, this ligament extends abnormally to the tip, so as to interfere with speech and mastication, and the child is said to be *tongue-tied*; recourse must be then had to division of the *frænum*, popularly known as *cutting the tongue*. Other folds of mucous membrane (the *glosso-epiglottid* folds) pass from the base of the tongue to the epiglottis; while from the sides of the base, passing to the soft palate, are seen two folds on either side, known as the *pillars of the fauces*. See **PALATE**. The *superior surface* of the tongue is divided into two symmetrical lateral parts by a median longitudinal furrow, commencing at the tip, and extending back about two-thirds of the tongue's length. The various kinds of papillæ which are seen on their surface are described in the article **TASTE, ORGAN AND SENSE OF**. At the back of the surface, just behind the circumvallate papillæ, are large mucous glands, extending into long and capacious canals, and helping to secrete the fluid that moistens the tongue. On the *inferior surface*, the longitudinal furrow, which extends from the tip to the *frænum*, is deeper than on the upper surface; on each side of it veins are seen running forward; and immediately beneath the tip is a cluster of mucous glands, known as the glands of Nuck (their discoverer in 1690). The *posterior extremity* or *base*, is flattened and extended laterally before it is inserted into the *hyoid bone* (known also as the *lingual* or *tongue bone*), which, with certain ligaments, must be regarded as the basis or framework of the tongue. The muscles of the tongue are usually divided into two groups—viz: the *extrinsic* muscles, which attach the tongue to certain fixed points external to it, and move it on them; and the *intrinsic* muscles, which pass from one part of the tongue to another, constitute its chief bulk, and move it on itself. These intrinsic muscular fibres run vertically, transversely and longitudinally, and are so interlaced as mutually to support one another, and to act with the greatest advantage. By the action of the various muscles, the upper surface of the tongue may be made concave or convex, or may be pressed against the roof of the mouth; the tip may be protruded straight out or laterally, upward and downward, and to any recess (as for instance, a hollow tooth) within the mouth where food might lodge; and the whole organ may be drawn back. The organ is freely supplied with blood, mainly by the lingual artery, which is given off by the external carotid. With regard to the nerves, the glosso-pharyngeal and certain branches of the third division of the fifth nerve are concerned in the special sense of taste (q.v.); other branches of the fifth nerve are concerned in ordinary sensation, while the hypoglossal nerve on each side is the motor nerve of the tongue.

The various uses or functions of the tongue cannot be thoroughly understood without a brief reference to its comparative anatomy. The tongue in mammals does not differ very materially from that of man; but in general there is a close coincidence both in size and form between this organ and the lower jaw. In the rodents the tongue has a wedge-like shape. In the giraffe and the ant-eater, the tongue is much prolonged, being an important prehensile organ in the former; while in the latter it is driven into ant-hills, and the victims are secured by its viscid secretion. In the feline races the conical papillæ are converted into recurved spines of great size and strength, which the animal uses in scraping bones and in combing its fur. Except in mammals, the tongue is probably not an organ of taste. For a good description of the tongue in birds, reptiles, and fishes, the reader is referred to Prof. Owen's *Anatomy of the Vertebrates*, vols. i. and ii. Among the mollusca, the gasteropoda are provided with a very singular apparatus known as the tongue, and consisting generally of a thin membrane, long and narrow, and rolled, except at its anterior extremity, into a tube. This membrane is covered on its upper surface with transverse rows of minute teeth, or more commonly with plates having tooth-like siliceous projections. These teeth present a great variety of patterns, which are constant in the different genera, and even characterize the species. Two eminent naturalists, Messrs. Loven, a Swede, and Troschel, a German, have independently made the teeth of the mollusca a basis of classification. The articulata do not present anything like a true tongue, although in insects a certain oval appendage is described as a *lingua*.

The functions of the tongue are gustation, prehension (in man and monkeys this function is supplied by the hand), mastication, insalivation, deglutition, and speech; to

which may be added spitting and whistling, and in the case of the gasteropoda, trituration of the food.

Among the diseases of the tongue may be mentioned INFLAMMATION or GLOSSITIS. The most marked characteristics of this affection are great swelling, tenderness, and difficulty in speaking and swallowing. It rarely occurs as an idiopathic or spontaneous affection, but often accompanies severe salivation. It must be treated by purgatives and low diet, and by gargling as in ordinary salivation (q.v.). Incisions are sometimes useful, both to relieve tension, and by the depletion that ensues. Cases occasionally occur in which the tongue suddenly enlarges to an immense size, so as almost to cause suffocation, without any true sign of inflammation.—See Druitt's *Surgeon's Vade-mecum*, 8th ed., p. 454, foot-note.

Hypertrophy, or persistent enlargement of the tongue, sometimes results from an imperfectly cured case of inflammation; but is probably in most cases congenital, although perhaps not noticed for a year or two. Bertholin (*Hist. Centur.*, iii. p. 85) mentions the case of a male child born with the tongue protruding out of the mouth as large as a filbert; and as the child grew, the tongue increased to the size of a calf's heart. For a reference to various cases, and for the mode of treatment, we may refer to a memoir by Dr. Humphry in vol. 36 of the *Medico-Chir. Transactions*. One of the most common forms of disease of the tongue is *ulceration*, which may arise (1) from the irritation of a decayed tooth with a sharp jagged edge; or (2) from constitutional syphilis; or (3) from a disordered condition of the digestive organs. In the first case the tooth must be removed; in the second, iodide of potassium with sarsaparilla should be tried; and in the third, the complaint generally yields to regulation of the diet and of the digestive organs, and sedatives at bed-time. M. Lawrance recommends a mixture of compound decoction of sarsaparilla with compound decoction of aloes, three times a day, and four grains of extract of hyoscyamus at bed-time, with advantage. *Cancer* of the tongue occurs either in the hard or in the epithelial variety. There is a popular belief that this terrible disease may be excited by the irritation caused by a broken tooth, or by smoking a clay pipe; but on comparing the prodigious numbers of jagged teeth and of clay pipes with the rare cases of cancer of the tongue, we must at once reject this hypothesis. All that such sources of irritation can effect is to determine the exact seat of development of cancer in persons predisposed to it. A typical case of epithelial cancer of the tongue occurred in the person of Prof. Reid of St. Andrews, the eminent physiologist. In Dec., 1847, his age being then 39, and his health good, he noticed a small ulcer on the right side of his tongue; it slowly extended, and acquired hard everted edges, but caused little inconvenience. In July, 1848, it had attained the size of a five-shilling piece; its surface and edges were ragged, and it caused considerable pain, especially at night. A hard ridge could be felt all round the ulcer, and the glands beneath the jaw became enlarged. The health by the end of August had completely given way from the pain, when the diseased part of the tongue was removed by the late sir William Fergusson. In less than a month the wound had healed, and the health was re-established. In November the enlarged glands were removed, but the disease returned in their scars, and spread till it caused death in July, 1849. The only treatment which can be adopted with any chance of success is full and early extirpation. Prof. Syme succeeded in removing the whole organ, without even—strange to say—much affecting the patient's speech or power of deglutition. *Tongue-tie* is an affection for which infants are often brought to the surgeon, and which is often operated on when this might be dispensed with. The division of the *frænum* with a blunt-pointed pair of scissors, with their point directed downward, is very easily performed, and fortunately does no harm to the child. Children who do not speak so soon or so clearly as is expected by their mothers, are always supposed to have tongue-tie.

TONGUES, GIFT OF, a gift of the apostles and other Christians in the first ages of the church. The main passages in the New Testament relating to it are Acts ii. 3-21; 1 Corinthians xii. 10, 28; xiii. 1, and particularly xiv. Allusions to it will also be found in Mark xvi. 17; Acts x. 46, and xix. 6. The only allusion to the possession of the gift in later times is in Irenæus, *Adv. Hær.* vi. 6: "We have many brethren in the church having prophetic gifts, and by the Spirit speaking in all kinds of languages." From these data, the following conclusions have been drawn by one of the most recent and intelligent expositors of the epistles to the Corinthians. The gift in question is represented as something entirely new in the apostolic age: "They shall speak with new tongues," Mark xvi. 17. The effect on the spectators at the day of Pentecost is of universal astonishment. It is represented as a special mark of conversion, immediately preceding or following baptism. It is a gift "of the Spirit." "They began to speak with other tongues, as the Spirit gave them utterance"—Acts ii. 4. It was, moreover, closely connected with the gift of "prophesying"—1 Corinthians xii. 10, 28; xiv. 1-6. It appears to be distinguished from prophesying by consisting not of direct warning, exhortation, or prediction, but of thanksgiving, praise, prayer, singing, and other expressions of devotion. It was an utterance of the heart and feelings, rather than of the understanding, so that the actual words and meaning were generally unintelligible to the bystanders, and sometimes to the speakers themselves: "He that speaketh with a tongue speaketh *not to men but to God*; for no one heareth; and in the

Spirit he speaketh mysteries"—1 Corinthians xiv. 2, 4, etc. So far, the account of the gift seems intelligible. It was, as Dean Stanley says, "a trance or ecstasy, which in moments of great religious fervor, especially at the moment of conversion, seized the early believers; and this fervor vented itself in expressions of thanksgiving, in fragments of psalmody or hymnody, and prayer, which to the speaker himself conveyed an irresistible sense of communion with God; and to the bystanders, an impression of some extraordinary manifestation of power, but not necessarily any instruction or teaching, and sometimes even having the appearance of wild excitement, like that of madness or intoxication." The special difficulty, however, remains, viz., as to the character of intelligibility which, on one prominent occasion, seems to have belonged to the gift. *Glōssa*, or the word translated "tongue," does not necessarily imply a distinct language of a people; this is usually expressed in the New Testament by *dialektos*. But in the description in the Acts ii. 6, 8, it is expressly said: "Every man heard them in his *own language*" (*tē idia dialektō*). "How hear we every man in *his own language*" (the same phrase in the original) "wherein we were born." The plain meaning of this account seems to be, that the gift of tongues, on this occasion, at any rate, assumed the form of intelligible communications in foreign languages. But there is no evidence that the apostles then, or at any subsequent time, enjoyed the ability, supernaturally imparted, of speaking a variety of languages, with a view to the more adequate discharge of their apostolic functions, as has sometimes been inferred from the passage in the Acts. "Probably," it has been said, "in no age of the world has such a gift been less needed. The chief sphere of the apostles must have been within the Roman empire, and within that sphere, Greek or Latin, but especially Greek, must have been everywhere understood. Even on the day of Pentecost, the speech of Peter, by which the first great conversion was effected, seems to have been in Greek, which probably all the nations assembled would sufficiently understand; and the speaking of foreign dialects is nowhere alluded to by him as any part of the event which he is vindicating and describing."—Dean Stanley (*Corinth.* p. 250).

TONIC, or **KEYNOTE**, in music, the note which forms the basis of any scale or key, and on which a piece of music written in that key naturally closes. See **KEY**.

TONICITY, **MUSCULAR**. The contractility of muscles shows itself under two distinct forms—*irritability* and *tonicity*, which are alike distinct in the mode of their action and in the conditions requisite for their exhibition. Irritability is most manifest in the voluntary muscles and in the heart, which, when in activity, exhibit powerful contractions alternating with relaxation; while *tonicity* is shown in a moderate and permanent contraction, which, instead of being consequent upon stimulation through the nerves, as in irritability, is especially excited by change of temperature in the tissue itself, and is mainly shown in the involuntary or non-striated muscles. Like irritability, it is an inherent property of muscular tissue during life. "It manifests itself," says Dr. Carpenter, "in the retraction which takes place in the ends of a living muscle when it is divided (as is seen in amputation); this retraction being permanent, and greater than that of a dead muscle. But its effects are much more remarkable in the non-striated form of muscular fiber; and are particularly evident in the contractile coat of the arteries, causing the almost entire obliteration of their tubes, when they are no longer distended with blood." It is to the moderate action of the *tonicity* of arteries that their contraction upon the current of blood passing through them is due. If the *tonicity* be excessive, the pulse is hard and wiry; but if it be deficient, the pulse is very compressible, though bounding, and the flow of blood is retarded. From the experiments of John Hunter and many subsequent physiologists, it is established that *cold* is the most efficient agent in inducing tonic contraction; while the application of moderate warmth causes a relaxation of this contraction. Thus, cold and heat are of extreme value as remedial agents, when the *tonicity* of the blood-vessels is deficient or excessive.

TONICS are medicines which, in cases of want of *tone* or *tonicity* in the muscular fibers, are employed to restore strength and vigor to the system. Tonics, to a certain degree, are stimulants; but while the latter produce a rapid but transitory excitement, the former slowly induce a certain degree of excitement, and the effect is permanent. Most, tonics, in which category we must place the shower-bath, cold sea-bathing, open-air exercise, friction, etc., as well as actual medicines of this class, act primarily through the nervous system (iron being, perhaps, the only exception); and secondarily produce their effects upon the muscular system at large. It is not only in general muscular debility that tonics are to be employed, but in all the numerous complaints which follow in its train, as palpitation, convulsions, epilepsy, chorea, neuralgia, and all forms of periodic disease. Among the chief medicines of this class are the dilute hydrochloric, nitric, nitro-hydrochloric, and phosphoric acids, various salts of bismuth, copper, iron, silver, and zinc, the various kinds of cinchona bark, with their alkaloids and their salts, cusparia, calumba, cascarrilla, chiretta, gentian, quassia, salix, simaruba, and taraxacum. Although nux vomica and its alkaloid strychnine are placed by writers on materia medica among the "special stimulants," when given in very small doses they have a well-marked tonic action; and there is probably no tonic medicine of more general utility than the *syrup of iron, quinine, and strychnine*, a non-official but widely-used preparation, of which every dram (the ordinary dose) contains $\frac{1}{16}$ of a grain of strychnine.

TONIC SOLFA. Various attempts have been made at different times to introduce a musical notation in which the staff with its lines and spaces is dispensed with. Jean Jacques Rousseau suggested, but afterward discarded, a notation where the notes of the scale were indicated by the Arabic numerals. A system similar to Rousseau's in its leading features, called the tonic solfa, has, through the influence of its principal promoter, the Rev. John Curwen (who obtained his main principles from the writings and practice of Miss Glover of Norwich), been brought into use to a considerable extent in singing schools in this country. It proceeds on the principle of giving the chief prominence to the fact, that there is in reality but one scale in music, which is raised or lowered according to the pitch of the key. The seven notes of the diatonic scale are represented by the solfeggio (q.v.) syllables, or rather Miss Glover's modification of them—*doh, ray, me, fah, soh, lah, te*; *doh* standing for the key-note in whatever key the music is written. In the early exercises, the pupils are accustomed to a scale or diagram, called the modulator, representing pictorially the exact intervals of a key, with the semitones in their proper places. In written music, only the initial letters of the solfeggio syllables are used—**d, r, m, f, s, l, t**; the higher octaves of a given note being distinguished by a ¹ above, as **d¹, r¹**; and the lower by a ₁ or ₂ below, **m₁, m₂**. The name of the key is prefixed to a tune as its signature, as "Key A," "Key B flat"—the key-note being, in all the major

keys, *doh*. To indicate rhythm, a perpendicular line precedes the

stronger or louder accent, a colon : the softer accent, and where necessary, a shorter perpendicular line | the accent of medium force. Preparatory to writing the notes, the accent-marks are placed at equal

distances along the page—thus, | : | : or : | : : | : : | :

or | : | : | : | : A note immediately following an accent-mark, is supposed to occupy the time from that accent to the next—

thus, | d : d : d | d : d : d | d, or | d : r | m : d. A horizontal line indicates the continuance of the previous note through another *aliquot* (the term used by Mr. Curwen for the distance

of time between any accent and the next)—thus, d :— | d : d. A dot

divides an aliquot into equal subdivisions, d : m.r | d. A dot after a mark of continuance indicates that the previous note is to be continued

through half that aliquot—thus, | d :— . f | m : d. A comma indicates

that the note preceding it fills a quarter of the time from one accent to the next—thus, | d : r.m,f | ; a dot and comma together, three-quarters—thus, | f.m : r.,d. An inverted comma , is used to denote that the note preceding it fills

one-third of the time from one accent to the next—thus, | d | s : l.s.f | m : r | d. An

aliquot or part of it unfilled, indicates a rest or pause of the voice. A line below two or more notes signifies that they are to be sung to the same syllable.

In modulating into a new key, the note from which the transition is taken is indicated by a combination of the syllabic name which it has in the old key with that which it has in the new—*me lah*, for example, being conjoined into *m'lah*; and in writing this note, the initial letter of its syllable, as a member of the old key, is placed in small size before and above the initial of the syllable of the new, as ^m**l**, ^e**s**. In the case, however, of an accidental, where the transition is but momentary, a sharpened note changes its syllabic vowel into *e*, and a flattened note into *aw*, spelled *a*, as *fah, fe*; *soh, se*; *te, ta*. In the minor mode *lah* is the key-note; the sharp sixth is called *bah*, and the sharp seventh *se*. The signature of the key of A minor is "Key C, minor mode."

TONKING. See **TONQUIN**.

TONNAGE, in regard to ships, is the measure of capacity, the ton being one not of weight, but of cubic content—i.e., 40 cubic feet. Very early in the history of navigation, some scale must have been established by which the relative capacity of different vessels could be determined. In England there are early laws upon the subject, settling the data upon which the calculation should be made. The present system, called "new measurement," dates from 1835; but the prior system, established in 1719, and

f¹m¹r¹d¹

te

tu

lah

se

soh

fe

fah

me

ray

doh

t₁l₁s₁f₁m₁

Modulator.

now known as O. M. (old measurement), still subsists among yachts and some other vessels. The old measurement was greatly erroneous, for the actual depth of the ship was not taken into account, but was assumed to be equal to her breadth. The tonnage was then obtained by multiplying together length, breadth, and assumed depth in feet, and by dividing the product by 94. As harbor-dues and such like taxes were levied according to each vessel's tonnage, it naturally followed under such a system that traders built their ships with as little beam and as great depth as they possibly could. The ships thus became highly dangerous in rough weather, and, moreover, every principle of correct naval architecture was set at nought, to produce deep wooden boxes capable of carrying a maximum of cargo with a minimum of beam.

TONNAGE (more properly **TUNNAGE**) AND **POUNDAGE**, certain duties on wine and other merchandise, which began to be levied in England in the reign of Edward III. They were at first granted to the crown by the vote of parliament for a limited number of years, and renewed on their expiry. The object of these imposts was said to be that the king might have ready money in case of a sudden emergency demanding it for the defense of the realm and the guarding of the sea. Originally fluctuating in amount, tonnage and poundage came to be fixed at 3s. on every tun of wine, and 5 per cent on all goods imported. In the reign of Henry V. they were first conferred on the king for life; and the same course being followed with his successors, the sovereign began gradually to consider them as his proper right and inheritance, and the vote of parliament as but a formality expressive of the popular recognition of his prerogative. Though these duties were not voted to Henry VIII. until the sixth year of his reign, he, notwithstanding, levied them from the date of his accession; and parliament in voting them took occasion to blame those merchants who had neglected to make payment. It was, in fact, usual to levy these duties during the period intervening between a sovereign's accession and his first parliament, and this was done by Charles I. as by his predecessors. The commons, however, in Charles's first parliament accorded these imposts not for life, but for a year only; and the house of lords objecting to this departure from previous usages, and rejecting the bill, tonnage and poundage were attempted to be levied by the royal authority alone, a proceeding which raised the opposition of the commons. Charles was, in 1629, induced to pass an act renouncing the power of levying these or any other imposts without parliamentary sanction. On the restoration, Charles II. obtained a grant of tonnage and poundage for life; and the same course was followed on the accession of James II. and of William III.; but by three several statutes of Anne and George I. (9 Anne, c. 6; 1 Geo. I. c. 12, and 3 Geo. I. c. 7) these imposts were made perpetual and mortgaged for the public debt. The customs consolidation act, introduced by Mr. Pitt in 1787, 27 Geo. III. c. 13, swept away tonnage and poundage, and all the other then existing charges, and substituted a new and single duty on each article. See **CUSTOMS DUTIES**.

TONQUIN, or **TONG KING**, a French dependency of Indo-China, bounded by China, the Gulf of Tonquin, Anam and the Shan States, with an area of 34,740 sq. miles and a pop. estimated at 9,000,000. Rice, sugar cane, cotton and tobacco are cultivated. The exterior trade is mainly in the hands of the Chinese. The capital is Hanoi (pop. about 150,000) and the chief port Haiphong. It is ruled by a French resident under the council of Indo-China, and the French maintain there an army of occupation which, in 1896, was about 19,000 strong. The French attempts to gain possession of T. date from 1873, when a French force under Garnier laid siege to Hanoi. The resistance offered by the Chinese pirates, called the Black Flags, rendered this attempt fruitless, but in the following year the French secured free trade with some of the towns and protection to the missionary stations in the country. The depredations of the Black Flags, however, continued and, in 1883, another expedition was sent against the country. This again was unsuccessful, but in the spring of 1884 as a result of the successes of generals Courbet and Millot, the French gained possession of the delta of the Red river. China renounced her claim to T. by the treaty of Tientsin, but, failing to evacuate the country with sufficient promptness, the French came into conflict with Chinese troops. In 1885, the Chinese troops were withdrawn. See the articles **ANAM** and **COCHIN CHINA**; also Rousset de Pomaret, *L'Expédition du Tonquin* (1894), and Lanessan, *La Colonisation Française en Indo-Chine* (1895).

TONQUIN, GULF OF, an arm of the China sea, bounded by Cochin China on the w., by China on the n., and by the Chinese province of Quang-tung and the island of Hainan on the east.

TONSILLITIS. See **QUINSY**.

TONSILS. See **PALATE**.

TONSURE (Lat. *tonsura*, a shaving, from *tondeo*, I shave), a religious observance of the Roman Catholic and oriental churches, which consists in shaving or cutting the hair as a sign of the dedication of the person to the special service of God and commonly to the public ministry of religion. It is a very ancient usage, and by some writers is represented as of apostolic origin; but that it did not prevail in the early ages is sufficiently plain from the fact with which Optatus upbraids the Donatists of his time (4th c.) of having shaved the heads of certain Catholic priests and bishops in derision. Jerome also in his *Commentary on Ezekiel*, c. 24, is equally explicit. It would appear that the usage first arose in reference to the monastic rather than the clerical life. Paulinus of

Nola, in the end of the 4th or beginning of the 5th c., alludes to it as then in use among the western monks; and it speedily passed from them to the clergy, the crown-like figure being regarded partly as a symbol of our Lord's crown of thorns, partly as an emblem of the "royal priesthood" of the Christian dispensation. The form of the tonsure was different in different churches, and the varieties of it are of some historical interest. That of the Roman church, called "the tonsure of Peter," consisted in shaving the crown as well as the back of the head, so that there remained a circular ring or "crown" of hair. This was the form in use in Italy, Gaul, and Spain. In the "Scottish (or Irish) tonsure," which was in use in Ireland, in north Britain, and in those parts of Germany in which the Irish missionaries had preached, the entire front of the head was shaved, leaving the front bare as far back as the line from ear to ear. This tonsure was called "the tonsure of James," and sometimes of "Simon the magician." The Greeks and other orientals shaved the *entire head*. The supposed derivation of the Irish form of tonsure from the apostolic times led to its being held both in Ireland and in Britain, as well as other churches of Irish foundation, to be of the most vital importance, inasmuch that the introduction of the Roman form was almost the occasion of a schism. Originally the tonsure was merely a part of the ceremonial of initiation in orders, and was only performed in the act of administering the higher order; but about the 7th c. it came to be used as a distinct and independent ceremonial, and a question has been raised whether it is to be considered as itself an order and to be added to the list of what are called the "minor orders" (see *ORDERS, HOLY*). The now received opinion of Catholic writers is that tonsure is not an "order," but only a "preparation for orders."—See Wetzzer and Welte's *Kirchen-lexicon*, art. "Tonsur."

TONTINE. This term is derived from the name of Tonti, a Neapolitan, who seems to have been the first propounder of a scheme for a financial association of which the prize or prizes were to accrue to the longest liver or livers. Generally, in an association on what is called the tontine principle, a payment is made by each member of the association, and with the capital so formed, an annuity, payable at the same rate until all the lives forming the association are extinct, is bought from some company or individual. This annuity is divided among the members according to age and premium paid by each; and on the decease of any member, the surplus thence arising is divided among the survivors; and on the death of the last member of the association, the total annuity reverts to the source from which it has hitherto emanated. There are, however, various kinds of tontines; and the designation of tontine may, with propriety, be applied to any financial scheme by which it is proposed that gain shall accrue to survivorship. In England, tontines have rarely been resorted to as measures of public finance. The last for which the government opened subscriptions was in 1789.—See Hamilton's *History of Public Revenue*, p. 210. Schemes on the tontine principle seem generally to be acceptable to the public, owing, probably, to the sort of sentimental faith which most persons have in their own prospects of longevity, and to the prudent desire for ease and affluence in old age. The application of the principle by life assurance companies in their mode of distributing "bonus," or surplus profits, has long been a subject of controversy among these valuable institutions. It would be impossible here to go into the argument with any degree of nicety. It may, however, be broadly stated as follows: A company formed for the purpose of life assurance means a company in which the members who are lucky in having long life are to pay for those who are unlucky in dying prematurely. But over and above the net mathematical premium payable by each member of an assurance society, or by each person assured at the risk of a company, a percentage, or "loading," as it is technically called, is added, to cover expenses of management and other contingencies. Where the funds of the company or society have been invested with average success, the loading is generally found, at the periodical actuarial investigations, to have been in excess of actual requirements; and the question then arises, How are "profits," or, in other words, the overcharges on premiums, to be divided? The question is plainly one of great intricacy. The argument used by the offices favoring the younger policy-holders is, that those which favor the older are really acting on a tontine principle, which is the very converse of what ought to prevail in life assurance; on the other hand, it is said that the fulfillment of the insurance contract is provided for by the net premium, and that the distribution of over-payments, as "profits" really are, is to be determined on principles wholly independent of insurance. See "Notes on the Early History of Tontines," by J. Hendricks, in the *Assurance Magazine* for July, 1862.

TONTY, HENRY DE, Chevalier, 1650–1704; b. France; served in the French army and navy. He came to Canada with La Salle in 1678, and accompanied him in his exploration of the Mississippi. He endeavored to establish a colony in Arkansas, went down the Mississippi twice to find La Salle and again to meet Iberville, and died at what is now Mobile.

TOOELE, a co. in w. Utah, adjoining Nevada; bounded n.e. by the Great Salt lake; 6240 sq. m.; pop. '90, 3700, chiefly of American birth. Co. seat, Tooele.

TOOKE, JOHN HORNE, a celebrated etymologist and political adventurer, was the son of John Horne, a London poulterer, and was b. in that city, June, 1736. He was educated first at Westminster and Eton, and afterwards at St. John's college, Cambridge, where he took the degree of B.A. in 1758. After spending some time as an usher in a

school at Blackheath, he entered the church (to please his father, and strongly against his own wish), and in 1760 became curate at New Brentford. The disgust he entertained for the sacred profession led him to indulge (by way of revenge) in a license of speech and life, which appears to us to have fatally affected the honesty of his character. It is impossible, for instance, to read a passage like the following (from one of his letters to Wilkes), without feeling a deep distrust of the whole man: "It is true I have suffered the infectious hand of a bishop to be waved over me; whose imposition, like the sop given to Judas, is only a signal for the devil to enter; but I hope I have escaped the contagion; and if I have not, if you should at any time discover the *black spot* under the tongue, pray kindly assist me to conquer the prejudices of education and profession." When Wilkes (whose acquaintance he had made during a trip to Paris) stood as a candidate for the county of Middlesex, Tooke zealously aided him, pledging his credit for Wilkes's expenses, and declaring that, "in a cause so just and holy, he would dye his black coat red;" but he afterward quarreled with his dubious associate, and in 1770-71, the two had a rasping epistolary controversy, which appears to have hugely gratified their enemies. He still, however, continued to meddle in political affairs, and even ventured to encounter (not without success) the formidable Junius. In 1773 he resigned his living at New Brentford, and commenced the study of law, a profession in which he was really fitted by nature to excel. About this time, he rendered some important private service to a Mr. Tooke of Purley in Surrey, who designed to make him his heir, but altered his mind, and only left him a legacy of £500. Altogether, however, he is said to have received from this gentleman about £8,000, and, in consequence, adopted the surname of Tooke, by which he is now known. In 1775 he was fined and imprisoned in the King's Bench for publishing an advertisement in which he accused the king's troops of barbarously murdering the Americans at Lexington. While in prison, he penned his celebrated *Letter to Mr. Dunning*, in which are to be found the germs of his *Diversions of Purley*. It excited a good deal of attention at the time, and even Dr. Johnson, who detested Tooke's political sentiments, expressed his intention—should he publish a new edition of his *Dictionary*—to adopt several of the "dog's" etymologies. On his release from confinement, Tooke made an attempt to gain admission to the bar, but was refused, on the ground of his clerical orders. Soon after, he reverted to political writing, at once the pleasure and the poison of his life, and in a *Letter on Parliamentary Reform*, advocated universal suffrage. In the struggle between Pitt and Fox, he pamphleteered on the side of the former, but soon got to hate Pitt too, as he had learned to hate most other public men. In 1786 appeared his famous *Epea Pteroenta, or the Diversions of Purley*, a work on the analysis and etymology of English words, which, amid much that is erroneous, both in principle and detail, contains still more that is acute, original, and true. In particular, he has demonstrated, says a *Quarterly Reviewer* (No. 14), that "all words, even those that are expressions of the nicest operations of our minds, were originally borrowed from the objects of external perception." See PHILOLOGY. But Tooke's passion for politics soon drew him from the calm pursuit of literature into the vortex of public life. In 1790 and again in 1796 he stood as a candidate for Westminster, but was unsuccessful on both occasions. At length, in 1801, the great enemy of rotten boroughs entered parliament for the most notorious rotten borough in England—Old Sarum; but he made no figure there. He died at Wimbledon, Mar. 19, 1812. Tooke was never married, but had several natural children, to whom he left his property. The best edition of the *Diversions of Purley* is that of Taylor (Lond. 1840).

TOOKE, THOMAS, 1774-1858; b. St. Petersburg; an English merchant in the Russian trade. He devoted himself to the study of economic laws, and published in 1823 *Thoughts and Details on High and Low Prices*. His chief work is his *History of Prices*, 6 vols. (1838-57), upon the last two vols. of which he was assisted by his pupil Newmarch. He was the founder in 1831 of the political economy club.

TOOLE, JOHN LAWRENCE, English comedian, b. in London, Eng., March 12, 1830, was educated at the City of London School, and became clerk to a wine-merchant, an occupation which he soon forsook. Being led to join the City Histrionic Club, he appeared at the Haymarket Theatre (London), July 22, 1852. Resolving to become an actor, he began his career at the Queen's Theatre, Dublin, Ireland, and achieved great success. In 1854 he accepted an engagement at the St. James' Theatre, in London, and sustained low comedy characters with acceptance. On the opening of the new Adelphi Theatre by Mr. Webster, Mr. Toole became leading comedian. He made professional tours throughout the English provinces for years. In July, 1875, he visited the United States, making his début in America, Aug. 17th. On the 17th November, 1880, he opened Toole's Theatre in London, having reconstructed and re-named the Folly Theatre.

TOOMBS, ROBERT, b. Washington, Ga., 1810; graduated at Union college, 1828; studied law at the university of Virginia, and began practice in Wilkes co., Ga. In the Creek war of 1836 he served as capt. of the volunteers. From 1837 to 1843, he was a member of the state legislature; in 1845 he was elected to congress and held his seat for four terms, or until 1853, when he was elected to the U.S. senate, and in 1859 re-elected. In politics Toombs was then, and remained, an extreme Jeffersonian democrat, believing fully in states-sovereignty, the right of secession and the propriety of slavery. It should be added, however, that in 1840 and 1844 he supported Harrison and Clay with the old line

whigs. As an impassioned political speaker he had few equals. The movement of secession had his full approval; and his influence, more than other's, led his state to pass the ordinance of secession, to which there was a strong opposition, especially among the "old line whigs." He was the choice of a great part, perhaps the majority, of southern voters for president of the new confederacy. On the election of Davis, Toombs was offered the office of secretary of state and with reluctance accepted it for a short time, on his resignation receiving a commission as brig.-gen.; he served at Manassas and Sharpsburg, and in 1863 was made brig.-gen. of the Georgia militia. After the war he lived for some time abroad, and after 1867 he carried on a successful law practice at his old home. He was noted for his brilliant wit, his legal sagacity and his benevolence. He was a bitter opponent of the "reconstruction" measures, and never took the oath of allegiance. He d. 1885.

TOON, or **TOONA**, *Cedrela toona*, a tree of the natural order *cedrelaceæ*, one of the largest timber trees of India. Dr. Hooker mentions one which he measured which was 30 ft. in girth at 5 ft. above the ground. The leaves are pinnate, the flowers small, in panicles, with a honey-like smell, the petals erect, and approaching each other so as to form a sort of tube. The tree ascends to the height of 4,000 ft. on the Himalaya mountains, and is found to the furthest s. of the East Indies. It is sometimes called *bastard cedar*. The wood is soft, but is used for furniture. The bark is a powerful astringent, and is used in dysentery, diarrhea, etc.

TOORKISTAN, or **TURKESTAN**. See **TURKISTAN**.

TOOTHACHE. See **TEETH**.

TOOTHACHE-TREE. See **ARALIA** and **XANTHOXYLUM**.

TOOTH-ORNAMENT, much used in the early English style.

TOP, in a ship, is the platform at the head of each lower-mast. It is supported on the trestle-trees and cross-trees, and serves to give a wider base to the top-mast shrouds. It is also used for working the upper sails. In a well-ordered ship, there is a captain and crew for each top. Formerly, in vessels of war, the top was fortified with hammocks all round, and in action was made to do duty as a sort of redoubt, whence a fire of small-arms, or even light swivel-guns, was poured upon the deck of the enemy.

TOPAZ, a mineral, ranked by mineralogists among gems (q. v.), and the finer varieties of which are much valued both for their luster and the beauty of their colors. It is composed chiefly of alumina and silica, the former, in general, more than 50 per cent of the whole, with fluoric acid, and usually a little oxide of iron. It is found generally in primitive rocks, and in many parts of the world. A crystal 19 ounces in weight was found in the Cairngorm mountains in Aberdeenshire, Scotland; and fine topazes are sometimes found in that part of Scotland, in Cornwall, and in the Mourne mountains in Ireland. Fine topazes are found in Ceylon, but those most prized by jewelers are generally from Brazil. The finer varieties of topaz are in general found either crystallized, or as small rolled masses, which may have been formed from crystals, in alluvial soil. Topaz is either colorless, or red, blue, green, or yellow, in great variety of shades. Its crystals are rhombic prisms, generally terminated by four-sided pyramids, but often variously bevelled and acuminate. The prisms are finely striated. The cleavage parallel to the base of the prism is easy. The specific gravity is about 3.5. The luster is vitreous. Topaz is translucent or almost transparent on the edges. It is harder than quartz. It is rendered very electric by heat or friction, and by this property a topaz may at once be distinguished from a diamond or ruby, for which otherwise, when cut and set, it might readily be mistaken. A coarse variety of topaz, called *pyrophyllite*, occurs near Fahlun, in Sweden, which is not crystallized. It is greenish white. When reduced to powder, it can be used as emery for grinding and polishing. —Topaz derives its name from the *topazion* of the ancients, which, however, seems to have been a totally different mineral.

TOPE, *Galeus canis*, a small species of shark, of the family *galeidae*, which has two dorsal fins and one anal, spout-holes, and the eyes furnished with a nictitating membrane, the first dorsal situated over the space between the pectorals and ventrals.

TOPE is the vernacular name of Buddhistic monuments intended for the preservation of relics. In Ceylon and elsewhere they are also called *dagops*; and another of their designations is *chaitya*. The difference between these terms results from their meaning. Tope is the Pāli *thūpa*, and the Sanskrit *stūpa*; it means, therefore, literally "accumulation," and conveys a sense analogous to that of the Latin *tumulus*. *Dagop* is a corruption of *dhatu-gopa*, i. e., relic-preserver; and *chaitya* applies generally to objects of worship, as images, temples, sacred trees, etc. *Tope* is, therefore, the name of those monuments in regard to their shape; *dagop*, in regard to their purpose; and *chaitya* the general term. Though the shape of the topes underwent many changes according to time and locality, it is possible to distinguish its oldest type from its later development. The oldest topes are in the shape of cupolas, generally spherical, but sometimes elliptical, resting on a cylindrical or quadrangular, or polygonal base, which rises either in a straight or inclined line, or in terraces. The top of the cupola, surrounded by a balcony of pillars of a peculiar kind, is crowned by a structure generally quadrangular, but sometimes in the shape of a reversed pyramid of a few steps; and over this structure is a roof in the shape

of an extended parasol (Sanskrit, *chhattra*; in Pāli, *chatta*). This was the form, for instance, of the topes of Sanchi, of the dagops of Ceylon, and the oldest monuments of this kind in the Punjab and Afghanistan; though in most of them the parasol, being of wood, is either completely destroyed, or merely recognizable in its fragmentary condition (see art. *Buddhism*, where, in the section of the cave temple at Karli, the tope is seen still surmounted by the wooden umbrella). The cupola was sometimes ornamented with more than one parasol; in some of the topes of Sanchi there are three, and even five parasols side by side, the middle one exceeding the rest in height. The different arrangement of these parasols, especially when their number increased, led to a different shape of the topes, such as occurs, for instance, in China and Thibet. This arrangement consists in placing them one *over* the other; and not only three or five, but even seven, nine, or more are so placed. The height of the structure thus became naturally greater than it originally was, and the topes, instead of having the character of cupolas, now assumed that of pyramids resting on a cupola base, the parasols gradually giving way to a real pyramidal form. In some monuments of this class, however, the cupola was placed above, when the base consists in round or quadrangular towers rising in a spiral form, or in several stories. The Chinese, on the contrary, rejected the cupola altogether, and merely retained the succession of parasols extended one over the other, converting them into a many-storied tower; and the same is the case with the topes of the Mongols, the *ssuvurghans*, which are pyramids erected on a low quadrangular base. The top of the pyramidal topes always carries some metal ornament, frequently gilt, resembling a parasol, or a needle, or a trident, or a rising flame. The height of these buildings varies from a few feet to 300, and even more; there are also topes of a few inches only, but they serve merely as ornaments in temples or buildings, or as symbols of the real topes. If erected in cave-temples the tope generally stands at the end of a long hall especially cut out for it, but sometimes also in the sanctuary of the cave-temple itself; if erected overground it stands always in the vicinity of a temple or convent. In the interior of the tope is the cell or chamber (*dhātugarbha*) where the box containing the relics and "the seven precious things" was placed. This cell consists of six slabs of stone, firmly closed after the box with the relics, etc., had been placed in it; and it was immured into the tope after its structure had, in the course of building, attained a certain height; the building then being brought to its completion, so that the cell enshrining the relic was inclosed on all sides with solid brickwork. The "seven precious things" referred to, with which the relics were ornamented, are differently enumerated; according to one account, they are gold, silver, lapis lazuli, crystal, red pearl, diamond, and coral; others mention ruby and emerald; and others, again, omit gold and silver. In several cells which have been opened the box contained, besides the relics, precious stones of various kinds, golden ornaments, and coins; and the box itself generally consisted of an outer casement of stone, clay, or bronze, which inclosed a silver cylinder, and within this a golden cylinder, which was the real receptacle of the relics. Both cylinders had generally a convex lid, representing the shape of the cupola, and the box exhibited inscriptions commemorating the name of the saint to whom the ashes or other relics contained in it had belonged. It seems that there are also topes which had the relics placed, not within, but under them—or, in other words, in the ground on which they were erected; for, in some which were opened, neither a cell nor any relic was found; and though it is possible that such monuments were merely erected in commemoration of some personage, there are, on the other hand, accounts which relate that relics were also placed under the dagops. Whether these accounts be correct it is at present impossible to say, as no foundation on which such dagops stand has as yet been explored. It has been supposed by some authors that the topes contained some secret passage leading to the relic-cell, known only to the priests or the initiated, who thus might gain access to the relics; for legends relate that during night such relics occasionally shed light, and that some pious king was deigned worthy of being favored with their sight; but none of the topes hitherto explored—and some of these are of the greatest dimensions—yielded any confirmation of this theory: they proved to be nothing but solid masses of brick and stone, without any chambers or passages—merely containing the relic-cell, of generally one foot in diameter. That the cupola of the topes was intended to represent the water-bubble, the Buddhistic symbol of the hollowness and perishability of the world is borne out by a legend in the *Mahāvans'a* (q.v.). The purport of the parasol may seem more doubtful; but as the parasol is the emblem of Hindu royalty, and as S'ākyamuni, himself the son of a king, replied to the question how he wished to be buried, by answering: "Like an emperor," it is not unlikely that the parasol of the topes was intended to imply the royal dignity possessed by a Buddhistic saint. When the topes became pyramids or towers consisting of terraces and stories, the number of the latter had likewise a symbolical import. Thus, only the topes of the most accomplished Buddhas had thirteen terraces, to show that these Buddhas had passed beyond the twelve causes of existence; three terraces imply the three worlds—the world of desire, that of form, and that of absence of form; five, the five steps of Mount Meru; and so on.—See C. F. Koeppen, *Die Religion des Buddha* (Berlin, 1857), vol. i. p. 533, ff., and the works quoted there.

TOPEKA, city, capital of Kansas, and co. seat of Shawnee co.; on the Kansas river, and the Atchison, Topeka, and Santa Fé, the Chicago, Rock Island, and Pacific, the

Leavenworth, Topeka, and Southwestern, the Missouri Pacific, and the Union Pacific railroads; 67 miles w. of Kansas City. It was laid out in 1854, became the state capital in 1861, and was made a city of the first class in 1881. The city is built on ridges at right angles with the river, is lighted by electricity, and has electric street railroads, waterworks on the Holly system belonging to a private corporation, and excellent natural drainage. It contains the state capitol, the state asylum for the insane, the state reform school, U. S. government building, Christ hospital, the Atchison, Topeka, and Santa Fé railroad hospital, Washburn college (Cong.), college of the Sisters of Bethany (P. E.), the Kansas medical college, and a free public library. There are several national and state banks, nearly 100 churches, and numerous daily, weekly, and monthly periodicals. The U. S. census of 1890 reported for Topeka, 371 manufacturing establishments, employing a capital of \$3,282,899, paying \$3,670,106 for materials, and having an output valued at \$6,752,449. The principal industry is the manufacture of flour. The city has also large railroad shops. Pop. '90, 31,007.

TÖPFFER, RUDOLPHE, 1799-1846; b. Geneva; was first a landscape painter; was appointed professor of aesthetics at the academy of Geneva; and became a novelist. He published *Le Presbytère* (1839); *La Bibliothèque de Mon Oncle* (1843); *Rose et Gertrude* (1845); *Nouvelles Gênévoises* (1845); and *Collection des Histoires en Estampes* (1846).

TOP-GALLANT, in a ship, the name applied to the third mast or sail above the deck, i. e., to the mast and sail above the topmast and topsail respectively.

TOP'HANE (correctly, TOP-HANEH), a suburb of Constantinople, forms a continuation of Galata along the northern shore of the Bosphorus. See CONSTANTINOPLE.

TOPHET. See GEHENNA.

TOPICS (the Gr. term *topike*, from *topos*, a place) was the name given by the Greek and Roman rhetoricians and grammarians to the art of discovering arguments. It consisted in the eliciting out of the series of particulars certain general conceptions and propositions, which, in the elaboration of oratorical discourses, served as guides in the invention and choice of suitable arguments. Any one such general conception was called in Greek *topos*; in Latin, *locus communis* (a "common place"). The Greeks bestowed much attention on this art; among the Romans, Cicero composed *Topica*, and various other treatises of a kindred nature. During the middle ages, it was proposed to apply it to the whole circle of human knowledge, and even to the solution of the most difficult intellectual problems; but, in general, these efforts only resulted in empty exhibitions of mental vivacity (*jeux d'esprit*); and in modern times, the so-called "art" has sunk so low that by the term "topic" one understands nothing more than a theme or subject for discussion and talk.

TOPKNOT, the popular name of some small fishes of the same genus with the turbot (q. v.) and brill. MULLER'S TOPKNOT (*Rhombus hirtus*) is not uncommon on some parts of the British coast, particularly the west coast of England. BLOCH'S TOPKNOT (*R. punctatus*) is more plentiful in northern parts. They are very similar, brown and mottled with very dark brown or black on the upper surface, white below. They live among rocks, where they are not easily distinguished by the eye from the sea-weed. Although very delicate fish, they are little regarded, the largest being seldom more than 7 or 8 inches in length. The breadth is about half the length.

TÖPLITZ, or TEPLITZ, a watering-place of Bohemia, one of the most celebrated of the German spas, is pleasantly situated on the Saubach (Pig's stream), 46 m. n.w. of Prague. The chief building is the palace of prince Clary, to whom the town in great part belongs; and behind this building are a park and gardens, which are the principal places of resort. Within their limits are the theater and the Gartensaal, the latter of which serves the purposes of reading, dining, and ball room. The town is historically important for the treaty of alliance signed there Sept. 9, 1813, between Russia, Austria, and Prussia, against Napoleon. The baths are supplied from 12 hot alkalo-saline springs, with temperatures varying from 90° to 117° Fahr. They are taken exceedingly hot, and have great virtue in restoring persons afflicted with gout, rheumatism, etc. Pop. of Toplitz, '90, 17,526. Between 7000 and 8000 strangers annually visit the baths.

TOPLADY, AUGUSTUS MONTAGUE, 1740-78; b. England; educated at Westminster school, and Trinity college, Dublin; was ordained, and preached in a chapel near Leicesters fields, London, 1775. He was the great champion of Calvinism in the church of England, and wrote much against the Methodists with great vigor of language and argument, but often with undue asperity of style. He edited for several years the *Gospel Magazine*. His controversial works, mostly in reply to Wesley, are numerous. He published some popular hymns, one of which is *Rock of Ages, cleft for Me*.

TOPOGRAPHY is literally a description of places (Gr. *topos*, a place), as rivers, hills, woods, but more especially cities, roads, bridges, streets, and even particular buildings. It differs from ordinary geography only in being more special and minute. Thus we have topographical descriptions of counties, provinces, and kingdoms, excellent specimens of which are Lewis's *Topographical Dictionary of England*, Anderson's *British Topography* (1881), a catalogue of the works on this subject; Murray's *Hand-Books*, etc.

TOPOGRAPHY, MILITARY. Among the first necessities of a military commander is a thorough knowledge of the physical conformation, the obstacles, and the resources of

the country in which he has to operate. It frequently happens that the field of warfare is one of which no careful survey is procurable. It devolves, then, on the officers of the staff to make their chief acquainted with all the particulars he requires; hence, topographical drawing is made a principal ingredient in the course of study at the staff college. These surveys devolve, in the field, on the quartermaster-general's department. An officer of this service is expected to traverse a country with rapidity, to measure distances by eye or intuition, to note them roughly down as he rides, to obtain a rough knowledge of hills and valleys, of roads and ravines, rivers and the means of crossing them. He must at the same time make himself acquainted with the means of sustenance produced by the country, with the feelings of the people—whether friendly or hostile—with the transport which can be drawn from the villages, with the position and strength of fortified places, and, in short, with every particular which can be of service to his commandant. His reconnaissance finished, not without fatigue and danger, he is expected to sit down and produce an eye-map, or a full report of all he has seen and heard.

TOPOLOBAMPO. The name given to a colony of 400 Americans who in 1886 settled near the Bay of Topolobampo, in Lower California. The colony was conducted on the co-operative system, but was not very successful. The people suffered greatly from lack of food and water, the soil was not fertile; and finally the colony split up, part going to Kansas to join a similar colony, and those remaining settling near the Rio Fuerte.

TOP-SHELL. See TROCHIDÆ.

TOQUE (Ital., *tocca*, “a cap”) is a name given in France to a small hat of the turban shape, worn by ladies. The term has become to some extent Americanized.

TOR (Celtic), “a projecting rock, is found in the names of mount Taurus and the Tors of Devonshire (Yes Tor, Brent Tor, etc.), and Derbyshire (Mam Tor, Chee Tor, etc.). The highest summits of the *Tyr-ol* are called *Die Taur-en*.”—Taylor's *Words and Places*.

TOR. See THOR.

TORBANEHILL MINERAL, a name sometimes popularly given to a mineral substance also known as BOGHEAD COAL, found on the lands of Boghead and Torbanehill, near Bathgate, Scotland, and celebrated for its value as a source of paraffine oil or naphtha (q.v.), of which it yields a much greater quantity than any other coal or shale found in Britain.

TORBERT, ALFRED T. A., b. Del., 1833; graduated at West Point, 1855; commissioned in the infantry. In 1861 he was made col. of a New Jersey regiment, and was present at the battles of Yorktown, Gaines's Mill, and West Point. He served with the 6th corps at the second battle of Bull Run, Antietam, and Gettysburg. He was also engaged at Cold Harbor, and through the Shenandoah valley. In 1865 he was placed in command of the army of Shenandoah. He retired with the rank of brevet brig.gen. in 1866, was subsequently consul-general at Havana and in Paris. He d. 1880.

TORCE, or WREATH, in heraldry, a garland of twisted silk, by which the crest is joined to the helmet. A crest is always understood to be placed on a torce, unless where it is expressly stated to issue out of a coronet or chapeau.

TORENO, JOSÉ MARIA QUEYPO DE LLANO RUIZ DE SARAVIA, Count 1786-1843; b. Spain; conspicuous in the rising against the French in 1808. He was returned to the cortes in 1810, but when Ferdinand VII. resumed authority in 1814, left the country, not returning till the death of Ferdinand. He became minister of finance in 1834, and the next year president of the council and minister of foreign affairs. He pursued a moderate policy, and was forced to resign, 1835. He wrote *History of the Insurrection, etc., of Spain* (1835).

TORGAU, a strongly fortified t. of Prussia, in the province of Saxony, stands on the left bank of the Elbe, 70 m. s.s.w. of Berlin. Among the public buildings are the castle, now used as a barrack and magazine, and comprising a church consecrated by Luther in 1544; a town-church, with pictures by Cranach; a gymnasium, and other schools. Weaving and brewing were once briskly carried on at Torgau, but the prosperity of the town has decayed. A battle was fought here in Nov., 1760, in which Frederick II. of Prussia defeated the Austrians. The allies besieged it 1813, and it surrendered Jan. 14, 1814. Pop. '93, 11,780.

TORGET, a small island off the n.w. coast of Norway, in lat. 65° 30' north. It serves as a landmark to sailors, is the haunt of numerous water-fowl, but is chiefly noteworthy for its lofty rock called Torghattan (the hat of Torget), which rises to the height of 756 ft. above sea-level, and is pierced right through, near the top, by a cave or passage 80 ft. wide, and 1300 ft. long.

TORLONIA, a princely Roman family, remarkable for their wealth, and for their extraordinarily sudden rise from the very lowest condition, trace their origin to a poor "cicerone," Giovanni Torlonia (1754-1829), who hung about the piazza di Spagna in Rome, and gained a precarious living by showing visitors over the colosseum. By steadiness and honesty, he obtained a reputation in his profession, became afterward an agent of the French emissaries who were sent to excite the Roman populace to revolution, and on the failure of this project was left with considerable funds in his hands; he afterward married a widow of means, and became a merchant, gradually rising, by dint of great intelligence, keen foresight, and enterprise, to the position of a stock-broker, usurer, and money-dealer; and by acquiring mortgages over the properties of the impoverished Roman princes, and by various other happy ventures, ultimately amassed an immense fortune. He was made a grandee of Spain, and duke of Bracciano by the pope. His three sons allied themselves with princely families of the highest rank; the eldest succeeded to the dukedom, and the two others carried on their father's business. The youngest became Prince of Civitella-Cesi, and duke of Ceri.

TORMENTIL, *Tormentilla*, a genus of plants of the natural order *rosaceæ*, sub-order *potentilleæ*, differing from *potentilla* (q.v.) only in the 4-parted calyx and corolla, and now united with it by many botanists. The COMMON TORMENTIL (*T. officinalis*, or *potentilla tormentilla*) is a very common plant in moorish and heathy places in Britain and throughout great part of Europe. It has a large woody root, which has long been officinal, being an agreeable and efficacious astringent, useful in diarrhoea and other complaints; and which contains tannin, gum, and a red coloring matter, not soluble in water, used by the Laplanders for staining leather red. The leaves are ternate, the leaflets lanceolate, and inciso-serrate; the stems ascending and forking, the flower-stalks axillary and terminal, and the flowers yellow.

TORMINA is the technical term for *gripping* pains in the belly.

TORNA, a co. in n. Hungary, in the Cis-Tibiscan circle, otherwise called Turnya; the smallest county of Hungary, bounded by Zips, Abauj, Borsod, and Gömör; 238 sq. m. Its surface is mountainous, producing small crops of hemp, and the vine is cultivated to some extent. Capital, Torna.

TORNADO. See WHIRLWINDS.

TORNEÅ, a river, important as forming part of the boundary-line between Russia and Sweden, rises in lake Torneå, in Sweden, and flows s.e. and s. between Russia and Sweden, entering the gulf of Bothnia at its northern extremity, after a course of 250 miles. At the mouth is the small town of Torneå (q.v.).

TORNEÅ, a t. in Finland, situated in 62° 48' n. lat., and 24° 12' e. long., on the peninsula of Svensar, at the mouth of the Torneå, in the government of Uleaborg. The pop., which in 1895 was 1326, is principally engaged in the exchange-trade with the more northern and scantily inhabited districts of Finland and Sweden, of which Torneå is the active center, as the most northern town in the Russian empire; deals, salt-fish, tar, hemp, reindeer skins, and other peltries being brought to Torneå to be exchanged for tobacco, spirits, manufactured goods, etc. Torneå is often visited in summer by travelers, anxious to witness the singular spectacle of the sun remaining above the horizon both night and day at the summer solstice. Torneå was several times taken by the Russians from Sweden before its final cession at the peace of Frederickshamm, in 1809, when it was ceded, together with the whole of western Finland, to Russia.

TORO, or **TORRO**, an ancient but decayed t. of Spain, in the modern province of Zamora, stands on the right bank of the Douro, 38 m. n.e. of Salamanca. It contains numerous religious houses, most of which have been allowed to fall into a state of decay; there are brandy-distilleries, vineyards, and woolen manufactories. Pop. '87, 8721.

TORONTAL, a co. in s. Hungary, in the Banat, w. of Temesvar; 3670 sq. m.; pop., '90, 591,260. It is drained by the Maros, Theiss, Béga, and Temes rivers, and is traversed by the Béga canal. The soil is remarkably fertile, producing wheat, cotton, maize, melons, flax, rice, tobacco, and the vine, but the surface is dotted by many swamps and marshes. Silk-worms are reared, and live-stock in large numbers; mineral products are coal, copper, and lead. The population is mixed, comprising Magyars, Serbs, Germans, and Roumanians; and there are Roman Catholic, Greek-Oriental, and Evangelical churches. Capital, Pancsova.

TORONTO, the capital city of the province of Ontario, Canada, stands on the n. shore of lake Ontario, in lat. 43° 39' n., long. 79° 23' w., 161 m. from Kingston, and 333 m. from Montreal. It is over 2 m. in length between e. and w., is bounded on the s. by the bay of Toronto, a spacious inlet of lake Ontario, and is 1½ m. broad from s. to north. The scenery of the vicinity is somewhat tame, and the situation of the town is low and flat, the most elevated quarter—the Queen's Park in the w. containing the university, observatory, and handsome private residences—being only from 100 to 200 ft. above the level of the lake. The harbor or bay, about 5 m. long and 1 m. in width, is formed by a curving spit of land running into the lake in a s. and w. direction to the distance of 3 miles. It is

capable of accommodating the largest vessels that navigate the lakes, and is defended at the entrance by a fort, which was thoroughly repaired in 1864 by the imperial government, and mounted with the most efficient modern ordnance. Toronto has much the appearance of an English town, and is distinguished for the number of its churches—many of which are surmounted by handsome spires. The principal are St. James's cathedral (Anglican), a noble edifice in early English, erected in 1852; St. Michael's cathedral (Roman Catholic); St. James's and St. Andrew's (Presbyterian); Jarvis street Baptist; Bond Street Congregational; and the Church of the Ascension (Anglican). Toronto is the fountain-head of the Canada school-system. Its higher institutions include the famous Toronto university, an imposing Norman structure, in Queen's Park; Trinity college; Baptist college; Knox college; Upper Canada college; the school of practical science; veterinary college; schools of dentistry and pharmacy; Collegiate institute; schools of medicine; and normal and model schools. The university park, with its beautiful monument to the volunteers who fell at Ridgeway, and the horticultural gardens, are frequented by all classes of the community. There are many benevolent institutions, as hospitals, asylums, etc.; and handsome official buildings, the seat of the supreme courts of the province; the legislative buildings; the Government House; the customs-house; and the post-office. The Grand Trunk and the Canadian Pacific railroads pass through the city, and, during open navigation, magnificent steamers ply in all directions on the lake. Cabinet-ware and iron rails are manufactured, and foundries, distilleries, and flour mills are in operation; the exports are manufactured lumber, flour, wheat and other grain. Pop. '91, 181,220, who return two members to the provincial parliament.

The name Toronto is supposed to be of Indian origin, but the meaning of the word appears to have been lost. The town was founded in 1794 by Governor Simcoe. It was incorporated in 1834, was burned by the Americans in 1813, and suffered severely in the insurrection of 1837, on which occasion it was the headquarters of the rebellion, as also from fire in 1849.

TORPEDO, a genus of fishes of the order *raiiæ* (see RAY), and family *torpedinidæ*. All the *torpedinidæ* were formerly included in this genus, itself originally formed from *raia*; but it has been divided into a number of genera, as *torpedo*, *narcine*, *astrape*, etc. The *torpedinidæ* have a short and not very thick tail, cylindrical toward the end, keeled on the sides. The disk is rounded, and has neither scales nor prickles. The most remarkable characteristic, however, is the galvanic battery, which all the species possess, and which is described and figured in the article ELECTRICITY, ANIMAL. The name torpedo is very commonly extended in a popular sense to all the *torpedinidæ*. Two species of torpedo are occasionally found on the southern coasts of England.—*T. vulgaris* or *marmorata*, which sometimes attains a large size, weighing 100 lbs.; and *torpedo nobiliana*, which is apparently more rare. They are readily distinguished by the spiracles behind the eyes, which are round and fringed at the edges in the former, oval and perfectly smooth in the latter. These and other species are found more plentifully in the Mediterranean, and the *torpedinidæ* generally belong to the warmer seas. The popular names *numb-fish*, *cramp-fish*, and *cramp ray* are given to torpedos by English fishermen. The electric shock which a large torpedo gives when seized is so severe, that no one who has experienced it desires to experience it again.

TORPEDO. During the war between Great Britain and the United States in 1812-14, this name was applied to certain mysterious boats invented by Fulton and other Americans for the purpose of navigating beneath the surface of the water, and injuring the bottoms of hostile vessels. In those days of hand-to-hand naval war, these designs (which, by the way, were failures) were looked upon as little less than diabolical. The progress of destructive weapons since those days has removed this aversion. The modern torpedo is of two kinds—first, the locomotive torpedo, which is in various ways projected against the side of a hostile vessel; secondly, the fixed torpedo, a kind of stationary bomb-shell intended to explode under the bottom of the enemy's ship. To these fixed torpedoes it is now more usual to give the appropriate name of submarine mines.

The weapon was first used by the Russians in the Baltic in 1854; but in the American war of secession of 1861-65 it was extensively and often successfully employed. The damage effected by a torpedo exploding beneath a ship is very great, but the failures are very frequent by the explosion happening at a wrong moment. In the Franco-German war of 1870-71; the French fleet was effectually scared from the Prussian ports by the dread of torpedoes. Torpedoes were much employed in the Russo-Turkish war of 1877.

Of fixed submarine mines there are two classes—those which are self-explosive on a ship touching them, and those which are dependent on an electric current supplied from the shore. A torpedo of the self-acting class is shown in fig. 1: *abc* is a hollow iron cone, water-tight, with a ring at *b* by which to anchor it. The upper part, *B*, is left empty, for the sake of buoyancy, while the lower end, *A*, is filled with gunpowder, the charge varying from 100 to 300 lbs. At the top of the powder is an iron case, *C*, filled with lime, and in it a tube of thin glass, *D*, containing sulphuric acid. The upper part of the glass tube is enveloped by the ringed end of the iron rod, *E*, which passes through the top of the torpedo, and some distance above it; and has horizontal rods, *G*, called feelers, attached rigidly to its upper extremity. When a ship impinges on the feelers, the rod is

deflected from the perpendicular; the ring at its lower end breaks the glass tube; the acid acting on the lime, generates great heat, and explodes the powder.

In the electric torpedo a wire insulated in a small cable is laid from a battery on shore to the sub-marine mine. It enters it by an insulated joint, and is then soldered to a small piece of platinum wire placed in the middle of the priming of the torpedo; from the other end of the platinum a second wire communicates with the metal sides of the torpedo case. On closing circuit at the battery, the current passes by the cable into the torpedo, heating the platinum to incandescence, and exploding the mine. There is thus no need of a second cable; the water and the earth take its place. Submarine mines are usually charged with gun-cotton, which has the great advantage of

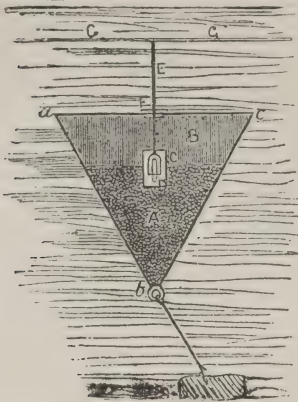


FIG. 1.

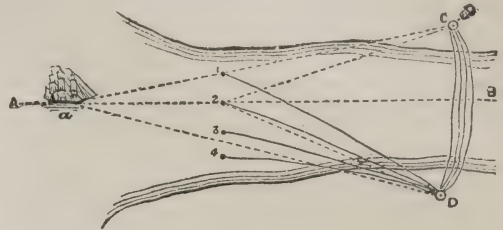


FIG. 2.

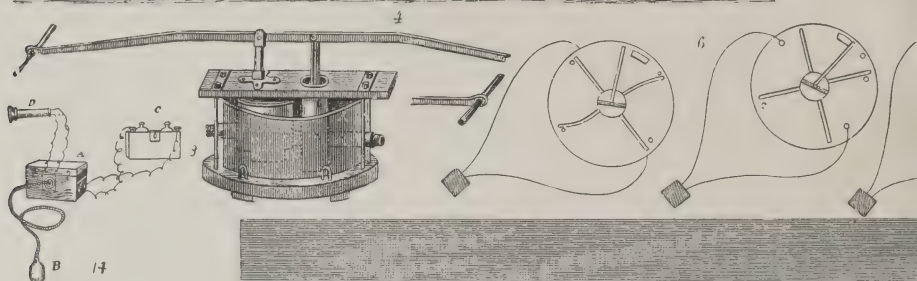
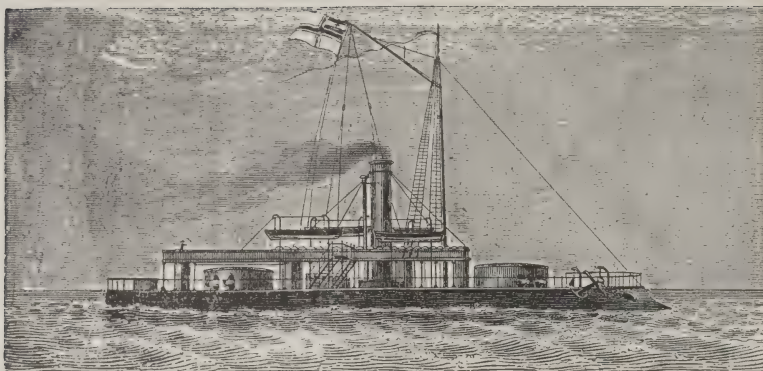
being explosive by means of a fulminating fuse, even when wet through leakage of the torpedo case.

Submarine mines are usually moored or laid on the bottom in several lines, the mines of the second line being opposite the intervals of the first, so that it is difficult for a hostile ship to pass up a defended channel without coming within reach of one or more of them. As a ship approaches, her course is carefully watched so as to fire a mine at the right moment. In order to explain how this is done, let us take the case of the channel AB.

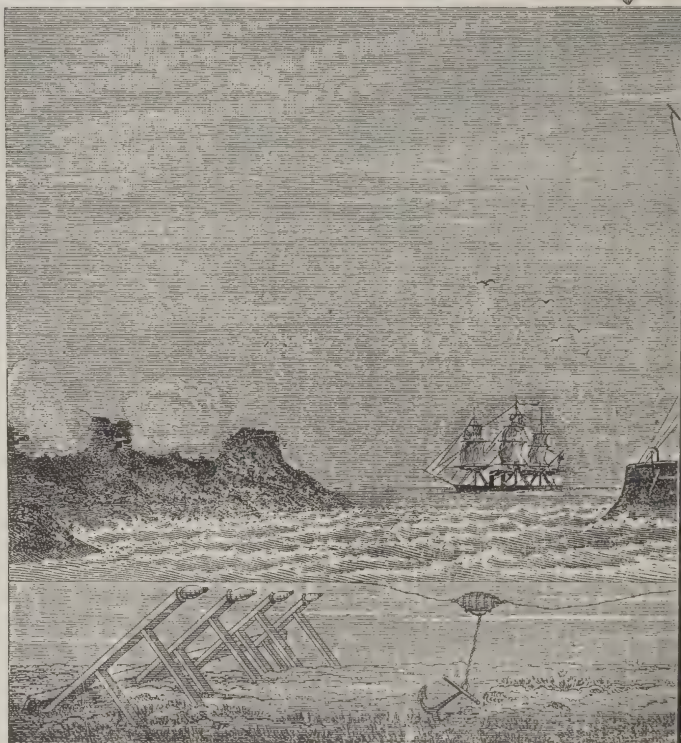
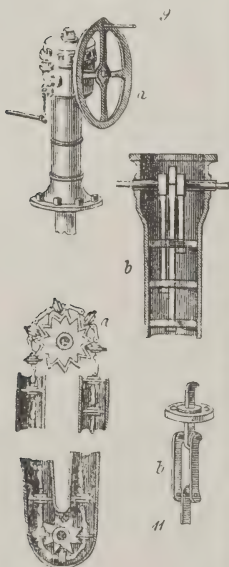
Two or more lines of mines are laid down across its mouth. For the sake of clearness we show only a few of those of the first line in the diagram. At C and D two stations are selected, commanding a view of the defended waters. At C is the voltaic battery, and the wires from the mines connect them with D, while a second series of wires, each corresponding with one of the first series, connects D and C. There are thus two breaks in the circuit of every mine, one at C, where a number of "firing keys" are arranged so as to place at will the battery in connection with any of the wires; the second break is at D, where similar firing-keys connect at will each wire of one series with the corresponding wire of the other. A ship is seen approaching on the course AB. When she is at *a* the observer at C notices that her bearing is the same as that of mine No. 1. He therefore closes the break in the first circuit by means of the firing-key, but no current passes, for the observer at D sees her well to the left of the bearing of mine No. 1, and therefore leaves his break open. Not until she is actually over No. 2 will both observers at the same moment see that her bearing corresponds to that of No. 2. and closing both breaks in the circuit, fire the mine.

The torpedo as a machine is the further development of an idea which dates back to the invention of gunpowder—the petard on land, the powder-ship at sea; but Bushnell, of Connecticut, appears to have invented at once, during our war of the revolution, the two factors of success—a sunken boat and an explosive torpedo. His was exploded by clock-work, and is of the first, or *applied* kind, the true torpedo; though he afterward experimented, and as fruitlessly as usual, with the second kind, the *drifting* torpedo, or infernal machine. The third variety, the *sunken*, is the submarine mine. The drifting torpedo is usually sunk by a line from a log or keg, and explodes when driven up against an obstacle by the tide or current. During the Turkish war of 1877-78 a floating can with surrounding arms was in use, as also a shuttle-shaped torpedo with a surrounding ring. All are evidently precarious in their action, and dangerous to all, whether friends or foes, who may chance to encounter them. If their use cannot be discontinued by national agreement, it seems only fair that any caught setting them should be subjected to martial law forthwith, ranking by right with spies, marauders, and private corps. There has yet been no fair trial by an invading fleet armed with the latest appliances of the efficiency of the third, or submarine mine. The Turks, with divers and the electric light, cut loose and raised the Russian torpedoes; nor is it necessary for this to capture the firing-stations. The English, working on the fact that the explosion under water of the equivalent of 300 lbs. of powder will explode all mines within a radius of 100 yards, invented a steam launch, directed by wires, which could be sent ahead, could drop two torpedoes, retire, and finally explode them, without other handling than the battery-wires. It has not yet been tried, and probably, in a sea-way, never will be. Nothing is so effective as the torpedo run out by a spar and exploded by a battery. Ours of the

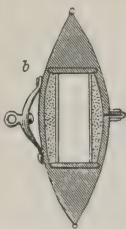
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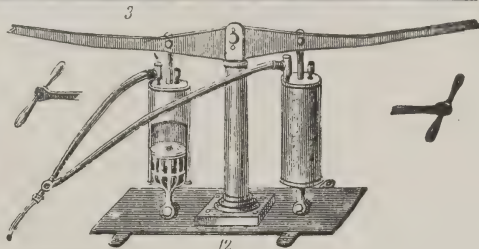
McEvoy's Torpedo Detector.



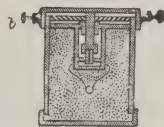
TORPEDOES, FIRE-ENGINES, ETC.—1. Monitor. 2. Torpedo barricade. 3. American torpedo. 7. Winged-torpedo. 8. Transportable fire-engine. 9. Downton's pump. 10. Pollard's barrel-torpedo. 14. McEvoy's torpedo detector. 15. Edison-Sims electric torpedo.



13



Living-Stone Electric Torpedo 15

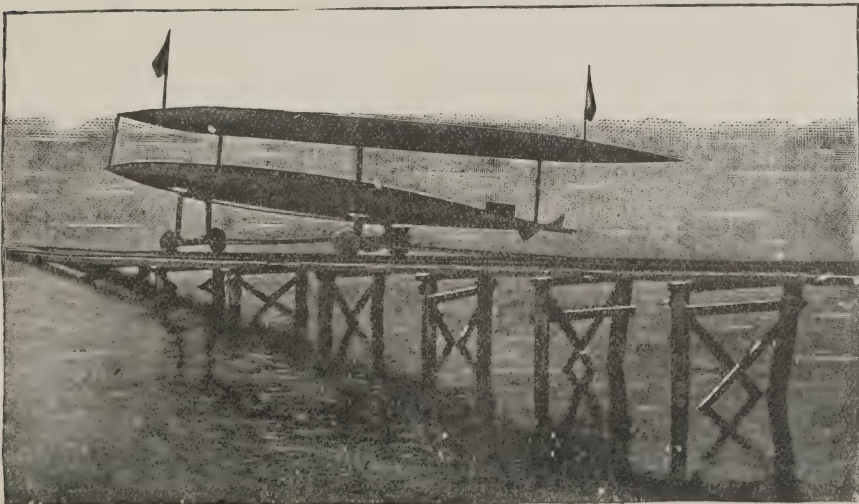


boat. 4. German monitor Arminius. 5. Automatic electric torpedo. 6. Cap apparatus. 7. Chain-pump. 11. Chain-pump. 12. Air-pump. 13. Paine's automatic

late war were percussive. The torpedo-boat invented by Admiral Porter, and constructed before the Turkish war, is an almost submerged steam launch, of iron, with a double skin, carrying four persons—the spar-man, who commands and manages the torpedo, the battery-man, a steersman, and an engineer. The idea was borrowed by the English about 1878, but almost all these boats are too large for the purpose. They carry a spar from the bow, and sometimes one on either side. The torpedo is launched, by dropping the spar, so as to strike the enemy at about 10 ft. below water; and a bowsprit, often with a spring buffer, prevents the launch approaching nearer than 20 ft. at the least, the limit of safety for the equivalent of 150 lbs. of powder. The Whitehead and its American prototype, the Harvey, and other towed torpedoes, and boom or spar torpedoes from a vessel itself, are all either uncertain in effect or impotent when in action and in a sea-way, from the very necessities of the case. Defense against torpedoes lies in booms of logs, with nets and, if possible, battery attachments, to show where the attack is made, and guns ready trained on certain points. Against torpedo-boats Hobart Pacha was the first to use a cordon of logs, made fast by lines to his yard-arms, and boomed out from the hull. Nets, and now wire-netting, have been substituted, with a line of spars all round to keep them at proper distance. The electric light should be used, with patrol boats, and a sufficient number of handy guns should be kept in readiness, so as to be quickly trained on any point. Gatling guns in the tops will pierce any common launch, made as they are of boiler iron; and the English rocket battery might be found useful. Better than anything is the new Hotchkiss repeating gun.

All the varieties of torpedo which military experts are testing at the present time, may be classed under two general heads: (1) the dirigible automobile torpedo, that is aimed, launched, steered, and exploded from a vessel or shore-battery by means of electricity; and (2) the self-steering torpedo, which after being started on its course makes its own way under the water toward its object, against which it explodes upon contact.

Of the first class the best known torpedoes are the Sims-Edison, which is somewhat favored by the United States Government, and the Patrick (also known as the Long, Hargin, or Wood). Several inventors have combined to improve and perfect the latter, which has been very favorably mentioned by a commission of United States officers after seven tests at the Torpedo School, Newport, R. I. The Patrick torpedo has been concisely described by Ensign J. M. Ellicott, U.S.N., as “a cigar-shaped vessel built of sheet-copper, about 40 feet long and two feet in diameter, and rigidly fastened on its back is a cigar-shaped float longer and narrower than the torpedo, made of the same material. Thus, while the float remains on the surface of the water, just awash, the torpedo hangs about four feet beneath it. The float is filled with lampblack, so that even if punctured repeatedly by bullets its buoyancy will not be seriously changed. It also carries two short flag-staffs, which indicate by their little flags the torpedo's course in the water. The torpedo carries in its head a charge of two hundred pounds of dynamite; in its central portion, a tank of liquid carbonic acid, and another containing lime and sulphuric acid separated; and in its after-end a spool of wire and an engine. It is started, steered, stopped, and exploded from the shore by electricity conveyed to it through a wire cable. About 7000 feet of cable is wound upon the spool in the torpedo, after being properly connected with the charge, the engine, and the rudder, and it then passes out through the propeller-shaft which is hollow and leads to the shore-station.”



AUTOMOBILE TORPEDO READY FOR LAUNCHING.

The torpedo is run out into the water upon a little truck, as shown in the illustration. A connection being then established between the lime and the sulphuric acid, heat is generated in the tank, and the carbonic acid passing by a coil of pipe through this heated receptacle goes on to the engine, which it sets to work, and the torpedo slips from the truck into the water, under which it glides toward the enemy, paying out the cable at its stern, and controlled by the operator at the station, who determines its progress by the little flags that rise just above the surface of the water. At the proper moment the touch of a button explodes its charge of 200 pounds of dynamite against the hull of the enemy's vessel. The Patrick torpedo has a range of a little less than a mile, and requires about three minutes to complete its run. The United States Government at the end of 1891 had purchased 15 of the Sims-Edison and 3 of the Patrick torpedoes.

The second form of torpedo is best represented by the Whitehead as a type, and it is this weapon which has been generally adopted by the governments of Europe. It represents the development of an idea originally put into shape in 1860 by Captain Luppis of the Austrian navy. The first design was for a torpedo-boat to be run by hot air and carrying a heavy charge of gun-cotton. This was to move above the water and to be guided and exploded from the shore. It was not then, in its inception, so different from the dirigible torpedoes already described. But Mr. Robert Whitehead, who was consulted by the inventor, so modified it as to produce an entirely novel form of torpedo, and one that now represents a quarter of a century of thought and study. It consists of a body of steel or bronze some 14 feet in length and about a foot in diameter. It carries a much less powerful charge than the Patrick torpedo; in fact, only some 60 to 70 pounds of gun-cotton. Its range is about half a mile, and it covers this distance in little more than a minute. It is driven by compressed air, which propels the torpedo by means of two screws, while the stern is fitted with two rudders. The Whitehead can be carried to sea by ships and from there launched at an enemy at a considerable distance.

The secret of the Whitehead torpedo has been purchased from the makers by each of the governments of Europe, except that of Turkey, for some \$75,000. Turkey declined to buy because during the Russo-Turkish war of 1878 two of these missiles fell into the possession of the Turkish admiral, Hobart Pasha, at Batoum. The secret was thus at the mercy of the Turks, and the manufacturers hastened to seek the recovery of the two torpedoes, a favor which was granted in return for the permission to manufacture the weapon without paying any royalty to the Whiteheads. The regular cost of each torpedo is \$1500.

The Whitehead torpedo is now used in the navies of England, Austria, France, and Italy, and of late the United States government has made a partial adoption of them.

The French Whitehead is 18.9 feet in length and 14.9 inches in diameter. It weighs 880 pounds, and has a speed of 28.5 knots up to 400 yards. The impulse of the weapon out of the torpedo tube is by gunpowder. All Whiteheads jump clear of the ship's side to a distance of about fifteen feet, plunge head foremost into the water like a great fish, dive down to a distance of about twenty feet, immediately shoot up again by the action of the water-valves, regulated to close and open under certain depth pressures, and then, for a hundred yards, pursue a slightly wavering motion until the action is progressive in a plane parallel to the surface of the water.

The Navy Department demands, drawn up in 1889 for the Howell torpedoes, were that the greatest diameter should not exceed 14.2 inches; that they might have any uniform length between 9 feet 6 inches and 12 feet. The total weight, it was specified, might vary in a proportional manner, from 428 pounds for a length of body or spindle of 9 feet 6 inches to 453 pounds for an extreme length of 12 feet, provided the space allowed for a charge of compressed wet gun cotton should be at least sufficient properly to stow a weight of that material equal to 17½ per cent. of the total weight of the loaded torpedo. The Howell torpedo is now compelled to have a speed of at least 32 knots per hour for the first 400 yards' run, and a speed of 28 knots for the second 400 yards' run. The vertical deviation after the first 100 yards must not exceed 2 feet, and the initial dive must not be greater than 25 feet.

The projectile of the submarine gun possesses elements of great simplicity, but since it depends entirely for its speed and range upon the force of its ejection, its usefulness is limited in radius below that of the automobile weapon. The automobile torpedo aims to attack the under-water hull of an enemy; in other words the vitals. To offset the attack of this weapon ships have been compelled to adopt the worst form of hamper ever foisted on ships of war—the net. All seagoing men-of-war are now compelled to carry the net as part of their defense system. No commander will use his net in action if he knows that his opponent does not carry automobile torpedoes, and every commander, it is safe to say, will use his net if he knows that his enemy carries them. A commander without automobile torpedoes, no matter how crude, must clog himself with this hamper, while he leaves his opponent who is provided with them not only unincumbered, but with a weapon capable of deciding an action at a single shot. The conclusion is an inevitable one that torpedoes must be employed so long as there is no weapon presented serving effectually to replace them.

An American rival of the Whitehead is the Howell, adopted by the United States. It was invented by Capt. J. A. Howell, of the United States navy, and is said to embody all the advantages of the Whitehead, with a superior directive capacity.

The invention of the modern torpedo has resulted in the creation of two new types of vessel—the torpedo-boat, built especially for the torpedo service, and the so-called "torpedo-catcher" or *contre-torpilleur*, built to overtake and destroy the torpedo-boat.

Torpedo-boats are of three varieties: (1) the sea-going torpedo-boat, intended to accompany squadrons on distant service; (2) the first-class or harbor-defense torpedo-boat; and (3) the second-class boat, a sort of steam launch, carried on board the huge battle-ships and lowered into the water when needed for action. All three classes are built for great speed, and are fitted with "torpedo-guns," or launching tubes at the bow and on turn-tables on the deck. These tubes discharge the torpedoes either by compressed air or with a small charge of gunpowder. In the different navies of the world in 1891 there were some 1300 torpedo-boats, of which the United States possessed only two—the *Cushing* and the *Siletto*—each having a speed of some 22 knots per hour. Great Britain had (1891) as many as 185.

The torpedo-catchers or *contre-torpilleurs*, of which the French vessel *Épervier* is a recent type, are in size between the largest torpedo-boats and the unprotected cruisers. They are built for extraordinary speed so as to overtake the torpedo-boats, and armed with rapid-fire and machine-guns (q.v.), and have also a number of torpedoes. The United States navy has no torpedo-catchers as yet. In 1891 Great Britain had 10, with a tonnage of 17,320, and built at a cost of \$4,424,400.

Mention may also be made of the so-called torpedo dépôt-ship, which is a vessel intended to accompany a fleet of torpedo vessels as a store-house of material, and rendezvous for repairs. Great Britain has but two of these and the United States none.

The development of the torpedo service has made new methods of protection for war-ships necessary. Electric search-lights are now provided for the instant detection of torpedo-boats in the darkness; a network of steel, commonly known as "crinoline," can be let down in such a way as to surround the threatened vessel on all sides with a hedge of protective metal, and batteries of machine-guns can in an instant be trained upon the approaching enemy. The torpedo in its latest development has yet to be tested in actual warfare, and naval experts are still in doubt how far the elaborate and ingenious mechanism will actually justify the labor and expense that have been lavished upon it for so many years. See an able paper by Ensign Ellicott, U.S.N., with drawings in *Engineering*, Nov. 14, 1890, and the article NAVIES, MODERN.

TORPEDO-BOATS. The United States up to 1890 had built but one modern torpedo-boat, the *Cushing*, which was launched by the Herreshoff Manufacturing Company at Bristol, R. I., on January 23, 1890. Her cost was \$82,750. She is 135 feet long, 15 feet beam, $3\frac{1}{2}$ feet draught, and 99 tons displacement. She is to carry eight automobile torpedoes and two 6-pdr. rapid-fire guns. Her trial took place in Narragansett Bay in March, 1890, during which a speed of 22.5 knots was maintained for three hours, and the Department accepted her. This torpedo-boat has developed additional speed and a remarkable handiness since she has been in service. The *Alarm* and the *Intrepid* were the first torpedo-boats built in the U. S., but they were for spar torpedoes and have not been duplicated. Foreign naval manœuvres have proved conclusively that torpedo-boats of small tonnage are not adapted for service at sea, and that their field of operations is restricted to within a short distance of the coast and harbors. The present tendency is to build boats exceeding 130 feet in length, with displacement ranging about 90 tons, carrying machine and rapid-fire guns in addition to the torpedo armament. European powers have begun but a comparatively small number of torpedo-boats during the past few years, although a large number have been added to the strength of the fleets; but these have, in a majority of cases, been completed in fulfillment of old contracts. In general it may be fairly said that the smaller type of torpedo-boats, so highly thought of in 1885, has lost much of its prestige. The principal sources of weakness in the smaller boats have been found to be in inefficient boilers and light construction of hull. The difference of the speed of torpedo-boats on trial and in actual service, almost always considerable, was well illustrated in races of the English torpedo flotilla in the Channel, in which the victor attained a mean speed of 16.25 knots per hour for five hours, while on the original measured mile it realized a speed of 21 knots. This was also illustrated in the competition trials of Russian torpedo-boats of various types, the loss of speed amounting to from $2\frac{1}{2}$ to 4 knots in boats but a year old. The six first-class torpedo-boats finished in 1890 in England were built by Messrs. Yarrow and Co. They are larger than those above referred to, being 130 feet long and having $13\frac{1}{2}$ feet beam, and they have had very successful trials: five of them attained a mean speed of 22.6 knots per hour during a continuous run of three hours, and the sixth boat made a little over 23 knots under similar conditions. The runs were made at stated intervals during the three hours' trial without any alteration whatever in the working of the machinery. They are propelled by triple-expansion engines and they have steel boilers of the locomotive type. Sufficient coal is carried to take them 2000 knots at a 10-knot speed, which renders them serviceable as sea-going boats for scouting duty. Their manœuvring powers are very remarkable, as they will turn a circle at full speed of a diameter of twice their own length, the time of

making the complete circle varying from one minute to one and a quarter. Their armament consists of one tube built in the bow for direct head fire, and two, mounted on a turn-table aft, are arranged to discharge on either beam at any desired angle. There are four rapid-fire guns, one on top of the conning tower, and three so mounted as to be available on either broadside. Early in the spring of 1890 the French Minister of Marine signed contracts for ten sea-going torpedo-boats of about 110 tons and thirty first-class boats of about 80 tons. These two are modeled after a type that has already rendered excellent service while attached to the Mediterranean squadron, and by superior speed and sea-going qualities are thought to more than make up for what has been lost in invisibility. The speed is placed at 24 knots. Italy has built a torpedo fleet of the Schichau type. These boats have a displacement of 130 tons, their triple-expansion engines develop about 2000 horse-power, their maximum speed is 25 knots, and their radius of action 4000 miles at 10 knots. Their armament is five rapid-fire guns and revolving cannon, one built-in stem tube, air impulse, two turn-table tubes aft, gunpowder impulse, and nine 14-inch Schwartzkopff torpedoes. Russia is adding several first-class torpedo-boats to her fleet each year. Germany had in 1891 sixteen under construction or about ready for trials. Eight have 110 tons displacement and 1400 horse-power, and the remainder 130 tons displacement and 2500 horse-power. They were designed to make about 23 and 25 knots respectively. All the old style of boats worth the change, and all the new Schichau boats have been uniformly fitted with one bow tube and two decked tubes on circular mounts. Austria had in 1891 twenty-one Schichau type boats of 83 tons displacement and twenty-seven Yarrow boats, varying in size from 48 to 88 tons displacement. She also has two Thornycroft and six Yarrow third-class boats of about 28 tons, making a total of 56 boats of all classes. She also has two English-built 25-ton Thornycroft boats. The Argentine Republic had in 1891 two first-class 110-ton boats built by Thornycroft, and she has six first-class 120-ton boats, to make 22.5 knots, and eight second-class to make 16 knots, built by Yarrow & Co. France and Spain have been the chief experimenters with submarine torpedo-boats, although the trial of the English boat Nordenfeldt attracted considerable attention about three years ago. The Gymnote and Goubet are the names of the French boats, and they have both performed remarkably well, although a general adoption of that type of boat seems not at present proposed.

The following table gives the torpedo-boats of the navies of the world, 1896.

| | Great Britain. | France. | Germany. | Austria-Hungary. | Russia. | Spain. | Denmark. | Netherlands. | Turkey. | Portugal. | Sweden. | Norway. | United States. |
|----------------------|----------------|---------|----------|------------------|---------|--------|----------|--------------|---------|-----------|---------|---------|----------------|
| Torpedo boats No. 1. | 144 | 196 | 168 | 41 | 125 | 60 | 11 | 36 | 37 | 23 | 22 | 11 | *18 |
| Torpedo boats No. 2. | 106 | 54 | 17 | 36 | 98 | 19 | 14 | 33 | 5 | 27 | 14 | 5 | 9 |

* Not including boats now building.

No. 1 includes torpedo-boats and torpedo-catchers over 100 feet in length, and No. 2 are those under 100 ft. in length.

TORQUAY, a seaport t. on the s. coast of Devon, occupying a cove on the n. side of Tor bay, 18 m. s. of Exeter, and about 210 from London. The name is derived from the Celtic "tor" (q.v.), a hill, which occurs in the appellations of the neighboring peaks of Dartmore (Hey Tor, Rippon Tor, etc.), and thence is given to the bay, and to the ancient parish of Tormohun or Tormoham, in which Torquay is situate. The monastery of Tor abbey was founded in the 12th c.; but the town of Torquay is of recent origin. The bay is noted in history as the place where William of Orange landed in 1688, and was often used as a naval rendezvous during the war with France; but till the beginning of the present century Torquay was little more than an assemblage of fishermen's huts. About that time the advantages of its climate—which are a peculiarly sheltered position, an equable temperature, and freedom from fogs—caused it to be resorted to by consumptive patients; and it soon attained a European celebrity, which is still almost unrivaled. The romantic hills and valleys of Tormohun and its environs are being rapidly overspread with villas, gardens, terraces, and rows of smaller dwellings. There are St. John's church, a fine church of modern Gothic architecture, and a number of others of various denominations, and numerous dissenting chapels. A stone pier was built in 1803, and the port is resorted to by colliers and small traders. There is a town hall, a museum, and a theater and a good harbor, which is now used as a yacht-station. The geological formation consists mainly of a range of transition limestone cliffs in strata much contorted, forming an excellent building material; and in some places, as at Petit Tor, presenting beautifully-tinted marbles, which are extensively worked. The limestone gives place at some points to old red sandstone, which gives its predominating color to the soil, and to argillaceous shale in beds of considerable thickness. The scenery is of the most varied and picturesque description. Besides the mild-

ness of the winter, the vicinity of the sea in front and of Dartmoor in the rear greatly moderates the summer climate, so that while the mean winter temperature is 44° , being 3° above that of Greenwich, that of the summer is only 55° , nearly 1° below that of Greenwich. The population has increased from under 1000 in 1801 to 25,534 in 1891. Kent's cavern, discovered in 1824, and the Brixham cave, discovered in 1858, are rich in fossils, and are among the earliest places in the kingdom in which prehistoric human remains have been found.

TORQUEMA'DA, JUAN DE, Cardinal, 1388-1468; b. Spain; became a Dominican friar, 1403; graduated at the university of Paris, 1424; prior of convents at Valladolid and Toledo; made master of the sacred palace at Rome, 1431; assisted at the condemnation of the doctrines of Wycliffe and Huss, and advocated the dogma of the immaculate conception; drew up project for union between Latin and Greek churches at council of Florence, 1439, for which he was made cardinal, and called the "defender of the faith;" made bishop of Palestrina, 1455, and of Sabrina, 1464. His *Meditations* was among the first books printed at Rome.

TORQUEMADA, TOMAS DE, 1420-98; b. Spain; became a Dominican monk and prior of a monastery at Segovia; appointed inquisitor-general of Spain by Ferdinand and Isabella, 1483, and confirmed by the pope with the title "confessor of sovereigns;" labored zealously in organizing the inquisition throughout Spain, particularly at Seville, Cordova, Jaen, and Ciudad Real; drew up the code of procedure; was prominent in the expulsion of the Jews and Moors from Spain; and during 16 years caused to be burned at the stake between nine and ten thousand persons. In the later years of his life, Pope Alexander VI. reduced his authority by associating with him four colleagues.

TORQUES (Celtic, *torc*; Lat., *torqueo*, I twist), a species of gold ornament, meant to be worn round the neck, which was much in use in ancient times, both among Asiatic and north European nations. It consisted of a spirally twisted bar of gold, bent round nearly into a circle, with the ends free, and terminating in hooks, or sometimes in serpents. These ornaments seem to have formed an important part of the wealth of those who wore them, and of the plunder obtained by the Roman conquerors from a Celtic or oriental army. A monument erected to a Roman soldier not unfrequently specified the number of torques that had been conferred on him. Numerous examples of the torques have been dug up in Great Britain and Ireland, as well as in France, and are to be found in archæological collections. Both in Europe and in Asia, the torques resembled one form of bracelet (q.v.) on a larger scale.

TORRE DEL GRE'CO, a city of southern Italy, in the province of Naples, 7 m. s.e. of Naples. The town is situated at the base of Vesuvius. The town is always new, being from time to time destroyed by the lava, and always raised again from its ruins, by the attachment of its inhabitants to their native soil. The soil is fertile, producing fruit and wines similar to those of Greece. Its inhabitants are engaged in the tunny, oyster, and sardine fisheries. Mention is made of the town under its present name (the origin of which is unknown) as early as 1324 A.D. It suffered much in the eruption of 1631, and in that of 1794 it was almost totally destroyed by the lava. The earthquake of 1856, and the eruption of 1861 when the town was overwhelmed by vast showers of ashes, were equally destructive. Pop. '81, 21,588, commune 27,652.

TORRE DELL' ANNUNZIA'TA, a thriving t. of southern Italy in the province of Naples, stands on the southern base of mount Vesuvius, 13 m. s.e. of Naples. A fishery and a coasting-trade are carried on. There are manufactures of arms, and the thermal springs are celebrated. Pop. '81, 20,060, commune 22,013.

TORRE MAGGIORE, a city of Italy in the province of Foggia and the district of San Severo. It contains a monastery and its principal industry is oil refining. Pop. '81, 8234.

TORRE PELLICE, a town of Italy in the province of Turin, and the district of Pinerolo. It lies at the base of Mt. Bandalin, and is the chief center of the Waldensian communities in the region known as the "Waldensian Valleys," adjoining the French frontier. It contains the remains of a fort, a gymnasium, a lyceum, an orphan asylum, and its principal industries are the spinning of silk, dyeing, and printing. Pop. '81, 2840

TORRENS, LAKE, sometimes a brackish lake, at others, merely a salt-marsh, in s. Australia; lat. $30^{\circ} 11'$ to 32° s.; and long. $137^{\circ} 30'$ east. It lies 30 m. n. of Spencer gulf. Length, 130 m.; breadth, 18 to 20 miles.

TORRES STRAIT lies between n. Australia and Papua or New Guinea, in lat. $9^{\circ} 20'$ to $10^{\circ} 40'$ n.; and long. $142^{\circ} 30'$ east. The channel is about 80 m. in width; and its navigation, though practicable, is rendered dangerous and difficult by the innumerable shoals, reefs, and islands with which it is strewn. It was discovered by Torres in 1606.

TORRES-VE'DRAS, a t. in the province of Estremadura, Portugal, on the left bank of the Sizandro, about 26 m. n. of Lisbon. It had a pop., '90, of 6079, and carries on some trade in wine; but derives its reputation solely from having given name to those famous lines of defense within which Wellington took refuge in 1810, when he found it impossible to defend the frontier of Portugal against the French armies; and from which in the year following, he issued on that career of slow and hard-won victory, which

ended in the expulsion of the French from the peninsula. The *first*, or outermost of these lines, extending from Alhandra, on the Tagus, to the mouth of the Sizandro, on the sea-coast, and following the windings of the hills, was 29 m. long; the *second* (and by far the most formidable) lay from 6 to 10 m. behind the first, stretching from Quintella, on the Tagus, to the mouth of the St. Lorenza, a distance of 24 m.; the *third*, situated to the s.w. of Lisbon, at the very mouth of the Tagus, was very short, being intended to cover a forced embarkation, if that had become necessary. The entire ground thus fortified was equal to 500 sq. miles.

TORREY, CHARLES TURNER, 1813-46; b. Mass.; graduated Yale college, 1830, studied theology with Dr. Ide of Medway; was settled at Princeton and Salem, Mass., but left the pastoral work to labor for the abolition of slavery. Detected in aiding slaves to escape from Maryland, he was tried, convicted, and imprisoned in the state prison at Baltimore, where he died of consumption. His remains were taken to Mount Auburn Cemetery, Mass. He published *Home, or the Pilgrim's Faith Reviewed* (1846), written while in prison; and *Memoir of W. R. Saxon* (1838).

TORREY, JOHN, LL.D., 1796-1873; b. N. Y.; graduated New York college of physicians and surgeons, 1818; one of the founders of the New York Lyceum of Natural History, of which he was many years president; professor of chemistry, geology, and mineralogy at West Point, 1824-27; of chemistry and botany in the College of Physicians and Surgeons, 1827-55; of chemistry and natural history in the College of New Jersey, 1830-54; chief assayer in the U. S. assay office, New York, 1853-73. His publications are: *Catalogue of Plants Growing Spontaneously within Thirty Miles of New York*; *Flora of the Northern and Middle States*; *Compendium of the Flora of the Northern and Middle States*; *Cyperaceæ of North America*; *Flora of the State of New York*; with prof. Asa Gray, began, 1838, the publication of *Flora of North America*. He prepared the *Botanical Reports* of various land exploring expeditions of the United States, 1822-58; *Appendix* to Dr. John Lindley's Introduction to the Natural System of Botany; contributed many papers on chemistry, mineralogy, and botany to the *Annals* of the lyceum of natural history, N. Y., the *Medical Repository*, *Silliman's Journal*, *Smithsonian Contributions*. His valuable herbarium and botanical library he presented in 1860 to Columbia College, in which institution he held a professorship of chemistry at the time of his death.

TORREY, JOSEPH, D.D., 1797-1867; b. Mass.; graduated Dartmouth college, 1816, and Andover, 1819; pastor of a church at Royalton, Vt., 1819-27; professor of Greek and Latin in the university of Vermont, 1827-42; of mental and moral philosophy, 1842-67; and president of the university, 1862-66. He translated Neander's *General History of the Christian Religion and the Church*, with copious learned notes; edited *Remains* of President James Marsh and *Select Sermons* of President Worthington Smith. A posthumous volume of lectures on *A Theory of Art* was published.

TORREY, JOSEPH W., b. Maine, 1828. In 1859 he went to China and for a time was editor of the *Hong Kong Times*. He engaged in trade, acquired great influence among the native merchants, and in 1867 became (under the sultan of Borneo) rajah of Maloodu and Ambong in Borneo, districts containing over 2,000,000 inhabitants, and also was made president of the "American trading company." He d. 1884.

TORREYA, a genus of the order *conifera*, somewhat resembling the yews. There are many species of the tree, which was named after John Torrey, the botanist. In this country the best specimens are the *Torreya California* and *taxifolia*. The latter, found in Florida, reaches the height of 50 ft., and has a close grained and strongly scented wood. Other varieties are found in India, China, and Japan.

TORRICELLI, EVANGELISTA, a celebrated Italian mathematician and philosopher, was born at Piancaldoli in the Romagna, Italy, Oct. 15, 1608. He was brought up by an uncle who resided at Faenza, and who put him under the tuition of the Jesuits. When 20 years old, he was sent to Rome, and there devoted himself to mathematical studies. Galileo's theories on force and motion, which had been published a short time before, especially engaged his attention, and led to his publishing a *Trattato del Moto* (1643), a meritorious work, but containing few new discoveries of consequence. The publication of this work led to his being invited by Galileo to visit him; and on the old philosopher's death, three months afterward, he was appointed to succeed Galileo in the chair of philosophy and mathematics at Florence. Here he resided till his death in 1647. The discovery which will preserve Torricelli's name through all ages was the interpretation of the previously known fact, that water will rise in a suction pump only to the height of about 32 feet. The fact that water *could* be raised in a pump was expressed by the empirical law, that "nature abhors a vacuum," and after the limit of 32 ft. was ascertained, the law was modified accordingly by Galileo. Torricelli wishing to perform this experiment more conveniently, employed mercury, and found that nature's abhorrence of a vacuum varied for different fluids, and was represented by a column of fluid in height inversely proportional to its specific gravity; here, then, was an additional fact of importance, containing the clue to the mystery, and Torricelli was not long in hitting on the idea that the column of fluid was sustained by the pressure of the atmosphere on the open surface of fluid. See **BAROMETER**. Torricelli also effected the quadrature of the cycloid, but in this was anticipated by Roberval.

TORRINGTON, a municipal borough and market t. of the co. of Devon, on an eminence sloping to the Torridge, 5 m. s.s.e. of Bideford. Pop. '91, 3436. The name of Torrington emerges frequently during the great civil war; and the capture of the town by Fairfax in 1646 proved fatal to the king's cause in the west.

TORRINGTON, a town and borough in Litchfield co., Conn., on the Naugatuck river. It is an important manufacturing town, having factories for the manufacture of hardware, bicycles, copper, nickel, silver, and woolen goods. It was the birthplace of John Brown. Pop. town, '90, 6048, borough, 4283.

TORSHOK, one of the most ancient towns in Russia, in the government of Tver, stands on the Tverza, in an undulating district, 309 m. s.e. of St. Petersburg. Leather and malt are the most important branches of manufacture; but the gold and silk embroideries of this town are well known throughout the empire, and obtained much celebrity at the London Exhibitions of 1851 and 1862. There is an extensive trade in corn, which the merchants of Torshok purchase in the neighboring districts and at the landing-places of the lower Volga, and thence transport to St. Petersburg by water. Much of this corn is ground at Torshok and the flour exported. The town was founded in the 11th century. Pop. 1895, 14,814.

TORSION is a method of common application in surgery for the purpose of checking arterial hemorrhage in certain cases. The wounded vessel is drawn out and fixed by a pair of forceps a quarter of an inch from the end; the end of the artery is then twisted round till it will not untwist itself. It is especially useful when there are many small arteries wounded in an operation, as, for example, in the extirpation of a large tumor.

TORSION-BALANCE, (Lat. *torsio*, twisting) is an instrument first invented by Coulomb, in which the force exerted by a twisted thread or filament to recover its original position, is made the means of measuring small degrees of electrical and magnetical attraction. See ELECTRICITY. It has also been used in determining the mass and density of the earth. See EARTH.

TORSK or, by corruption, Tusk (*Brosmius vulgaris*), a valuable fish of the family *gadidae* (q.v.), abundant in the northern parts of the Atlantic ocean. The genus is characterized by a single long dorsal fin, and by having the vertical fins separate. The torsk is from 18 in. to 2 ft., rarely 3 ft. long; the head small, the body moderately elongated, one barbule under the chin, the dorsal and anal fins distinct from the tail, although separated from it by a very short interval; the tail rounded; the head dusky; the back and sides yellow, passing into white on the belly. It lives in deep water, approaching the land in shoals only at the spawning-time, which is very early in the year. It spawns among the sea-weed of the coast. It is caught in the same manner as cod, ling, etc.; and although rather firm and tough when fresh, is generally esteemed, when dried and salted, to be the best of stock-fish. It is occasionally caught in the frith of Forth, but belongs to more northern regions, and is very abundant in the Shetland isles, the Faroes, on some parts of the coast of Norway, and on the s. and w. coasts of Iceland.

TORSO (Ital.), strictly, signifies a trunk, e.g., the trunk of a tree, but is specially applied to an ancient statue of which only the body remains. Of such imperfect relics of classic art, the most famous is the *Torso of Hercules*, a masterpiece of manly beauty, discovered in the Campo del Fiore at the beginning of the 16th c., and placed, by order of Pope Julius II., in the Vatican.

TORSTENSSOHN, LENNART, Count of Ortala, the most active, enterprising, and successful of the Swedish generals who were engaged in the Thirty Years' war (q.v.), was born at Torstena, Aug. 17, 1603, became one of the royal pages in 1618, and attended Gustavus Adolphus in most of his earlier campaigns. When Gustavus entered Germany in 1630, Torstenssohn was capt. of the body-guard; and the brilliant services he rendered at Breitenfeld, the Lech, and on other occasions, were rewarded with rapid promotion. Taken prisoner at the combat of Nuremberg (Aug. 24, 1632), he was subjected to rigorous treatment, which so ruined his health, that on his exchange six months after, he returned to his post in the Swedish army a confirmed invalid; yet a vigorous mind and energetic character so overmastered bodily infirmity, that though reduced to the necessity of being always conveyed in a litter, he proved himself a most able officer under Bernhard of Weimar and Baner, the successors of Gustavus. In 1641, on the death of his former chief, the able and chivalrous Baner, he was appointed to the command-in-chief of the Swedes in Germany. His military career was marked by a brilliancy of conception, fertility of resource, resolute daring, and above all, by an extraordinary rapidity of execution, which broadly distinguished it from those of his contemporaries, and set at naught all the precautionary and defensive measures of his opponents. Having recruited and equipped his army, he invaded Silesia, routed the Austrians at Glogau and Schweidnitz, reduced most of Moravia, and being pressed back into Saxony by the archduke Leopold and Piccolomini, gallantly turned upon the multitude of his pursuers (Nov. 2, 1642), and on the field of Breitenfeld, where Tilly's reputation for invincibility was cast down in the dust by Gustavus, inflicted a bloody defeat on the same adversaries; he then resumed the execution of his plans of invasion, and laid Moravia and Austria under contribution. Ferdinand III., despairing of protecting his territories from Torstenssohn, negotiated with Christian IV. of Denmark to make a

diversion by invading Sweden; but Torstensohn, with characteristic promptitude, left Moravia in Sept., 1643, traversed Saxony and the Upper Palatinate, burst into Holstein, and in less than six weeks subjugated the Danish mainland. The Austrians under Gallus followed in pursuit of him, to aid their allies, but arrived too late; and in attempting to coop him up in Holstein, were routed, and driven into Saxony; and again totally defeated (Nov. 23, 1644) at Jüterbogk, in attempting to bar his return into Bohemia. Gallus was now deposed; but a combination of talented generals, as Montecuculi, Goertz, and others, was found to be equally ineffective against the resistless Swede, who, by a great victory at Yankovitz (Feb. 14, 1645), secured the navigation of the Danube, and the possession of the hereditary countries north of it. The emperor, empress, and principal nobility now deserted the capital; the Saxons again joined the Swedes; and the Danes, routed at sea as well as on land, besought peace, which was granted (Aug. 13, 1645). At this time, when a few more of Torstensohn's weighty blows would have completely unseated the Hapsburg family, his gradually increasing ailments compelled him to resign the command to one very much his inferior, and retire to Sweden, where he experienced a most distinguished reception from queen Christina, was created a count, and appointed to various high offices successively. He died at Stockholm, April 7, 1651.

TORT (Lat. *tortus*), in the law of England, includes all those wrongs for which a remedy by compensation or damages is given in a court of law, and which wrongs arise irrespective of any contract. Such are assaults, imprisonments, taking one's goods without title, injury to one's body or character. The general rule of law was, that the right of action for a tort died with the person who committed it; but this defect has been cured by a statute to a certain extent. If the wrong was done within six months preceding the wrongdoer's death, an action may be brought against his executors within six months after they have assumed office. So if the injured party lived, he could always bring an action of damages; but if he died, his executors or relatives could not do so, until lord Campbell's act enabled the wife, husband, parent, or child of such deceased injured party to sue for damages; and in such case the jury may apportion the damages between the widow and children who sue. The right to bring an action for a tort is limited to two, four, or six years respectively, according to the nature of the wrong.

Tort in U. S. law differs from a breach of contract in these respects; that the death of either party to the tort ends the right of action, that joint tort-feasors are severally liable, with no right of contribution from each other; and that persons under disability to contract are liable for their torts. One of the chief distinctions between torts and crimes is that in the latter a criminal intent must be proved, while in the former intent is immaterial; yet in some torts, e.g., slander or malicious prosecution, a malicious intent is essential. Torts may be committed against the person, as assault and battery, false imprisonment; or against one's character, as libel and slander; or against property, as trespass or trover. An injured party cannot recover for an injury in any way contributed to by his own wrong; and to maintain an action there must be a loss as well as a wrong.

TORTEAU. See **HERALDRY**.

TORTOISE, *Testudo*, a genus of chelonian reptiles, which once included the whole order, but is now much restricted. The popular name tortoise is never given to the marine chelonians, which are called turtles (q.v.), and although it is sometimes given—generally with a prefix, as marsh tortoise, river tortoise, fresh-water tortoise—to the kinds which inhabit fresh water (see *EMYS* and *TERRAPIN*), yet, when used by itself, it is commonly the designation of what are distinctively called land tortoises, which belong to the genus *testudo* as now restricted, and the genera most nearly allied to it. In *testudo* the carapace is of a single piece, bulged, and soldered by the greater portion of its lateral edges to the *plastron* (see *CHELONIA*); the legs are very short; the toes are very short, and united to the nails, which are thick and conical, five on the fore-feet, and four on the hind-feet. The species are numerous and widely distributed, inhabitants of the warmer temperate and of tropical countries. They all feed on vegetable food. None of them are found in Britain, but several in the countries around the Mediterranean. The most common of these is the GREEK TORTOISE (*T. Græca*), which attains a length of 12 in., and has a broad and equally bulged carapace; the scales of which are granulated in the center, striated on the margins, and spotted or marbled with black and yellow. This is the species of an individual of which a most interesting account is given by White in his *Natural History of Selborne*. It lives to a very great age, 100 years or more, as probably do all the other species, and spends the winter in a dormant state, as do all those which are not inhabitants of tropical climates; selecting for itself a place of hibernation when cold weather begins to come on, or preparing it by scooping a hole in the earth. During the heat of summer it feeds voraciously; but in colder weather, both before and after its hibernation, it eats little. The love-season, which is in the beginning of summer, is one of great activity, and tortoises express their amorous desires by striking their shells against those of their mates. The Greek tortoise is used for food in some parts of the s. of Europe. The flesh of all species of tortoise appears to be good for food, and the eggs of all are regarded as delicacies. A very large species is the Indian tor-

toise (*T. Indica*), if several species are not confounded under that name. It has been found on the coast of Coromandel, 4½ ft. in length, its bulge being about 14 inches. It is particularly abundant in the Galapago islands, and has even been supposed by Darwin to be originally a native of them, and to have been diffused from them by the buccaneers over other tropical regions. It is known that the buccaneers often carried away tortoises alive from the Galapagos, but this fact does not seem probably to account for the abundance of the species in other places. The Galapago tortoise is often 200 lbs. in weight. Its flesh is of excellent quality, as are also its eggs. It forms tracks from the arid districts near the shore to the high districts of the islands, where there are springs, for the purpose of drinking; and these tracks, which are broad and well beaten, are traversed apparently at irregular intervals, the animal swallowing a very large quantity of water at a time, so that its bladder is greatly distended, and the water contained in the bladder is at first almost pure, and is gradually absorbed. The numbers of tortoises in some tropical and subtropical countries are very great. Prof. E. Forbes speaks with admiration of the numbers of *T. Græca* and *T. marginata* straying about the plains of Lycia, and browsing on the fresh herbage in spring. Darwin describes the tortoises of the Galapagos as very numerous; and Leguat, in his account of the French Protestant expedition to the island of Rodriguez, in the beginning of last century, declares that the tortoises often came out together in such numbers to feed, that a man might have walked for a considerable distance on their backs as on a pavement.

The *testudo polyphemus*, or tortoise-gopher of the southern states (*xerobates Carolinus*, Ag.), has a shell fourteen or eighteen inches long, and burrows in the ground, digging holes four or five feet deep. They prefer the pine barrens, where they often live in troops. They are very strong, being capable of carrying a weight of over 200 pounds. The females are the largest, and their eggs are valued as food, as is the flesh of both sexes. See BOX TORTOISE.

Tortoises exhibit very little intelligence; they are, however, capable of recognizing the hand that feeds them.

TORTOISE PLANT. See HOTTENTOT'S BREAD.

TORTOISE-SHELL, the large scales of the carapace, or shield, of a species of sea-turtle, the *chelonina imbricata* and *testudo imbricata* of several authors—*caretta imbricata* of Dr. Gray. It is found in the Indian ocean, Amboyna, New Guinea, Seychelles, Havana, and the Red sea. Tortoise-shell is so called because formerly the order of animals to which it belongs was little known, and all were confounded under the general name of tortoises. A remarkable peculiarity in this species is the arrangement of the thirteen plates forming the carapace, which, instead of being joined together by their edges, so as to make apparently one piece, are thinned off at their edges, and overlap each other like the tiles of a roof. They vary in size according to the part of the shield they occupy. The larger are sometimes from a foot to 18 in. long, by 6 in. broad; the thickness rarely exceeds the eighth of an inch. The beautiful mottled color and semi-transparent characters of this material are well known. A remarkable quality is possessed by tortoise-shell, which very greatly increases its usefulness for the ornamental purposes to which it is generally applied—that is, its property of being easily softened by a heat equal to boiling water, and of retaining any form when cold which has been given to it when heated. Pieces can also be welded together by the pressure of hot irons properly applied. In Britain, the chief use of tortoise-shell is making combs for the hair; but it is also used for inlaying small pieces of ornamental furniture and various other fancy objects. In India, China, and Japan its use is well understood, and some very beautiful articles are made of it, exhibiting great skill and taste. Great Britain alone consumes about 15½ tons, of the value of about \$120,000.

TORTO'LA. See VIRGIN ISLANDS.

TORTO'NA (anc. *Antilia*, or *Dertona*), a t. of northern Italy, in the province of Alessandria, and situated on the right bank of the Servia (a small river which flows n. to join the Po), and 12 m. e. of Alessandria, with which it is connected by railway. Pop. '81 9230. The principal buildings are the *Duomo* and church of San Francesco. Tortona has manufactures of silk, leather, hats, etc. It was a notable place in the middle ages—the old walls and the ruins of a castle in which Frederick Barbarossa lived being a relic of those turbulent times.

TORTO'SA (anc. *Dertosa*), an old and fortified t. of Spain, province of Tarragona, picturesquely situated on a sloping eminence, overlooking the Ebro, from the mouth of which it is distant about 22 miles. The town has a cathedral with fine carved work and marbles. There are manufactures of paper, leather, soap and pottery, but the fisheries give employment to the greater part of the people. Pop. '87, 24,192.

TORTU'GAS (Sp. Turtles), a group of ten islets or keys, also called the Dry Tortugas, belonging to the United States, at the entrance of the gulf of Mexico, and included in Monroe co., Fla. They are low coral islets, partly covered with mangrove bushes. There are lighthouses on Loggerhead key and on the bastion of fort Jefferson, on Garden key. During the civil war the fort Jefferson was used as a penal station for confederate and other military prisoners.

TORTURE. Examination by torture, otherwise called "the question," has been largely used in many countries as a judicial instrument for extracting evidence from unwilling witnesses, or confessions from accused persons. In ancient Athens, slaves were always examined by torture, and their evidence seems on this account to have been deemed more valuable than that of freemen. Any one might offer his own slave, or demand that of his opponent, to be examined by torture; and it was supposed to constitute a strong presumption against any one that he refused to give up his slave for that purpose. No free Athenian could be examined by torture, but torture seems occasionally to have been used in executing criminals. Under the Roman republic, only slaves could be tortured, and, as a general rule, they could not be tortured to establish their master's guilt. Under the empire, torture, besides being much used in examining slaves, was occasionally inflicted even on freemen, to extract evidence of the crime of *læsa majestas*. Cicero and other enlightened Romans wholly condemned its use. Until the 13th c., torture seems to have been unknown to the canon law; about that period, the Roman treason-law began to be adapted to heresy as *crimen læsæ majestatis Divinæ*. A decree of pope Innocent IV. in 1282, calling on civil magistrates to put persons accused of heresy to the torture, to elicit confessions against themselves and others, was probably the earliest instance of ecclesiastical sanction being adhibited to this mode of examination. At a later period, however, torture came to be largely employed by the inquisitors.

From the civil war, torture became a part of the legal system of most European countries. It was adopted early, and to a large extent, by the Italian municipalities. In Germany, elaborate apparatus for its infliction existed, not merely in the dungeons of the feudal castles, but in the vaults beneath the town-halls of Nuremberg and Ratisbon, where the various implements used are yet to be seen. It continued to be practiced in the prisons of Germany when they were visited by Howard in 1770. In France it was part of the judicial system till 1789, and in Scotland it was still in frequent use after the restoration, and was only abolished by 7 Anne, c. 21, s. 5.

The use of torture seems always to have been repugnant to the genius of the law of England: though occasionally used by an exercise of prerogative, it may be doubted whether it was ever recognized as lawful in the ordinary course of the administration of justice. The first instance we have of its use is in 1310, in aid of the ecclesiastical law, during the struggle between Pope Clement V. and the templars. Edward II., when applied to to sanction the infliction of torture by the inquisitors in the case of certain templars accused of heresy and apostasy, at first refused; but on a remonstrance by Clement, he referred the matter to the council; and on the recommendation of the council, the inquisitors were authorized to put the accused to the torture, but without mutilation or serious injury to the person, or effusion of the blood. During the Tudor period, the council assumed the power of directing torture-warrants to the lieutenant of the Tower, and other officers, against state prisoners, and occasionally also against persons accused of other serious crimes; and similar warrants were at times issued under the sign-manual. Under James I. and Charles I., torture was less resorted to, and only in state trials. In 1628, in the case of Felton, the assassin of the duke of Buckingham, the judges declared the examination of the accused by torture, for the purpose of discovering his accomplices, to be illegal. Torture was inflicted for the last time in England in May, 1640. It is now disused in all countries of Europe, and is universally acknowledged to have been a most unsatisfactory mode of getting at the truth; often leading the innocent, from weakness of body, to plead guilty to crimes which he had not committed.

The instruments of judicial torture have been various. The most celebrated is the rack, an oblong horizontal frame, on which the accused was stretched, while cords, attached to his legs and arms, were gradually strained by a lever or windlass, an operation which, when carried to extreme severity, dislocated the joints of the wrists and ankles. It is as old as the 2d c. in the south of Europe, but is said to have been unknown in England till introduced into the Tower by the duke of Exeter, constable of the Tower, whence it acquired the name of the "duke of Exeter's daughter." In Germany, the rack was sometimes furnished with a roller, armed with spikes, rounded off, over which the sufferer was drawn backward and forward. A vertical rack was also in use in that country. The person subjected to it was raised to the roof by a rope attached to his arms, which were bound behind his back, and two heavy stones having been attached to his feet, the rope was loosened so as to let him fall with a jerk to within a few inches of the ground. Among the lesser tortures may be mentioned the thumbikins, boots, pincers, and manacles; and in England, an instrument called the Scavenger's (properly Skeffington's) daughter, the invention of sir William Skeffington, lieutenant of the Tower in the reign of Henry VIII.

TO'ULA CEREVIS'IE, or the YEAST-PLANT, is one of those fungi which are connected with the process of fermentation. The general history of this fungus will be noticed in the article YEAST, and we shall here only refer to the medicinal bearing of the subject. This plant, which is also known under the name of *saccharomyces*, *mycoderma cerevisiæ*, and *cryptococcus fermentum*, may be readily observed by examining a little yeast under the microscope, when it will be seen in the form of round or oval corpuscles

(cells), varying in diameter from the 800th to the 400th of a line, and many having smaller corpuscles in their interior. They grow by protrusion of gemmules, and germinate sometimes on one, and sometimes on several spots of the primitive fungus cells. These shoots throwing off new gemmules, the yeast-plant gradually forms single or branching rows of oblong cells, connected together like beads. This peculiar arrangement of the cells, and the fact that they are not acted on by acetic acid, is characteristic of the plant.

This fungus exists in the saccharine urine of *diabetes mellitus*, after it has been discharged for 24 hours or longer, and its appearance in urine within a day or two is sufficient to lead to the suspicion of the presence of sugar. It likewise is of not unfrequent occurrence in vomited matters and in fecal evacuations; and wherever it is found, it is indicative that the fluid is in a state of saccharine fermentation.

As fungi more or less closely resembling the yeast-plant often occur in non-saccharine urine that has stood for some days, the assumed presence of the *T. cerevisiæ* must not be taken as a proof of the presence of sugar, although it affords a strong hint for testing for that substance.

TORUS, the convex member of the base of classic columns. See **COLUMN**.

TORY, a political designation taken, it is said, from savage Irish tribes, and originally applied to the followers of the duke of York, afterward James II. Johnson defined the tory as "one who adheres to the ancient constitution of the state and the apostolical hierarchy of the church of England." The present "conservative" party of England is the historical successor of the tories. In this country during the revolution the adherents of the crown were called tories. A curious local use of the word was that of the common people in some parts of the south during the civil war, applying it to irregular troops or "bushwhackers" claiming to be federals. See **WHIG AND TORY**.

TOSHACH. See **TANISTRY**.

TOSTI, FRANCESCO PAOLO, composer, b. in Ortona di Mare in the Abruzzi, Italy, April 7, 1846. After studying at the Naples Conservatorio, he was appointed an instructor there. He resigned in 1869, went to Rome and appeared in concerts as a singer, after which he was made vocal-instructor at court. In 1875 he went to London, and in 1880 was appointed singing teacher to the royal family. His works are: *The Grand Duke*, opera, London, 1888; and *La Prima Donna*, opera, 1889; and Italian and English songs and duets, which have become universally popular.

TOTEM. The ruder races of men are found divided into tribes, each of which is usually named after some animal, vegetable, or thing which is an object of veneration or worship to the tribe. This animal, vegetable, or thing is the *totem* or *god* of the tribe. From the tribe being commonly named after its totem, the word is also frequently employed to signify merely the tribal name. Numerous tribes with totems exist in America, in Australia, the South Pacific islands, and in central Asia; and there are some reasons for thinking that such tribes were once numerous even in Europe among races belonging to what is called the Indo-European division of the human family.

Among the red Indians of America the following are totems of tribes existing or known to have existed: the wolf, bear, beaver, turtle, deer, snipe, heron, hawk, crane, duck, loon, turkey, musk-rat, sable, pike, cat-fish, sturgeon, carp, buffalo, elk, reindeer, eagle, hare, rabbit, and snake; the reed-grass, sand, water, rock, and tobacco-plant. Among the tribes of native Australians the totems are similarly, for the most part, selected from the fauna of the country.

It has been suggested that the explanation of the crests and emblems of the now disrupted tribes and clans of our own country, and of Europe generally, is to be found in the supposition that the creature or thing on the crest was originally the totem of the clan or tribe. On this supposition the wide-spread clan Chattan or Cattan, for instance, which is represented in the Scotch Highlands, and can be traced in France, Germany, and Egypt, would fall to be recognized as the *cat* tribe, the cat having once been its *totem*, as it is still its crest or emblem. It has also been thrown out that many of the mythical traditions of ancient Greece admit of a reasonable meaning, if we suppose that there were anciently in Greece tribes with *totems*—bull, boar, and lion tribes; snake, ant, and dragon tribes. These suggestions have not yet been put to the test of a thorough investigation; but so far as inquiry has gone, the results are in favor of the conclusions to which they point as to the early condition of human tribes all over the world. A single instance may be given of success in tracing back a totem to old times and in widely separated countries. There are numerous existing snake tribes both in America and the South Sea islands, and there is something like *proof* that the snake was the totem of very many and powerful ancient races. Its worship can be traced among Semitic races; there are traces of it in the traditions of the Pelasgi; there are proofs of it among the Celts; and the most magnificent ecclesiastical architecture in the world is that of the Nagas—the serpent-worshippers of Cambodia—still existing, and only recently brought to light. We may believe that, in the period of primitive animal-worship, when the serpent was a creature of so much importance, other animals also had their worshippers, and that snake-tribes were not the only tribes with animal totems in those times, any more than they are among existing primitive peoples.—See *Cambrian Journal*, vol. iii. 2d series, p. 149; *Grey's Journals*, vol. ii. chap. xi.; Mitchell's *Russians in Cen-*

tral Asia; Latham's *Descriptive Ethnology*; Sydenham's *Baal Durstrigensis*; and footnote to *Kinship in Ancient Greece*, by J. F. McLennan; *Fortnightly Review*, April-May, '66; and works of Tylor, Lubbock, Spencer; Dorman's *Origin of Primitive Superstitions* (Philadelphia, 1881).

TOTIPALMÆ, Cuvier's name for a group of birds, of the order *palmipedes*, having the hind-toe connected with the other toes by a web. Pelicans, cormorants, frigate-birds, gannets, and darters belong to this group. All the totipalmæ are marine; they feed on fishes, mollusks, and other marine animals, and are excellent swimmers and divers. Many of them have long wings, and are birds of powerful flight.

TOTNES, or **TOTNESS**, a parliamentary borough and market t. of Devonshire, pleasantly situated on the slope of a steep hill, on the right bank of the river Dart, about 21 m. n.e. of Plymouth. It is a place of great antiquity, has an interesting church of the 15th c., and some curious antique houses; the ruined keep of the ancient castle, on the summit of the hill, is said to have been built by Joel de Totneis, a Norman baron, on whom the manor was bestowed at the conquest, and who founded here also a Cluniac priory. Pop. '81, 4089; '91, 4016.

TOTTEN, GEORGE M., 1809-84; b. New Haven, Conn.; d. New York: was educated at Middletown, Conn. He was engineer on the Farmington, Juniata, and Delaware and Raritan canals; was also chief engineer of the Digua canal, in Colombia. He was one of the contractors who built the Panama railroad, and in 1879 went to the isthmus in connection with the Panama canal; and later was appointed consulting engineer.

TOTTEN, JAMES, 1818-71; b. Penn.; graduate of West Point, 1841; an artillery officer in the Florida and Mexican wars. In the late civil war he commanded the arsenal at Little Rock, Ark., when it was taken by the confederates; served as chief of artillery in Missouri under Gens. Lyon and Fremont; and commanded a division under Halleck. He was at one time inspector-gen. of the department of Missouri, and subsequently of the department of the Atlantic; brevet maj.-gen. of volunteers, 1865.

TOTTEN, JOSEPH GILBERT, 1788-1864; b. Conn.; graduated at West Point. During the war of 1812 he was chief engineer successively of the army under Van Rensselaer, Dearborn, Izard, and Macomb, and was brevetted lieut.col. for gallantry at Plattsburgh. As a member of the board of engineers he matured a plan for the defense of the coast and sea-ports. He supervised the construction of fort Adams, Newport, 1825-38. The latter year he became chief engineer, and col. of the corps of the engineers. During the Mexican war he had charge of the engineering operations at the siege of Vera Cruz in 1847, and was brevetted brig.gen. for his skillful conduct of the siege. In 1815 he made a model of an embrasure for casemated batteries. In 1830 he conducted a series of experiments to test the strength of different kinds of timber, and the expansion and contraction of building stone by changes of temperature. He made experiments, 1851-55 "on the effects of firing with heavy ordnance from casemate embrasures;" the results which he reached have been guides in such constructions down to a recent period. He published in 1838 *Hydraulic and Common Mortars*.

TOUCAN, *Ramphastos*, a Linnæan genus of birds now forming the family *ramphastidae*, which belongs to the order *scansores*, and contains nearly forty known species, all natives of tropical America, and remarkable for the magnitude of the bill. They are divided into two groups, the true toucans (*ramphastos*), and the aracarís (q.v.) (*pteroglossus*), of which the latter contains the greater number of species; the former has the largest bill, and the tail is shorter. There is a difference also in the prevalent colors, the aracarís generally exhibiting much green and yellow, while the true toucans have the ground color of the plumage usually black; the throat, breast, and rump often gayly adorned with white, yellow, and red. The colors, however, are not in general finely blended, but appear in strong contrast. The legs of toucans are short; the feet have two toes before and two behind. The form of the body is short and thick; the tail is rounded or even, varying in length in the different species from half the length to almost the whole length of the body, and is capable of being turned up over the body in a remarkable manner, which it always is when the bird is at roost. The neck is short and thick; the enormous bill is at the base of the full width and depth of the head, and is in some species more than half the length of the body. It is arched toward the tip, irregularly toothed along the margins of the mandibles, and extremely cellular and light, yet strong in structure. The tongue is very long, narrow, and singularly feathered on each side, the processes which give it this feathered appearance probably adding much to its sensibility as an organ of taste. When a toucan takes food between the points of the mandibles, the tongue is immediately applied to it, as if to test or enjoy it, and afterward it is tossed into the throat by a sudden throwing back of the head. Toucans may almost be described as omnivorous; they eat fruits with avidity, but they also seize and devour small birds. Their powerful bill enables them to kill a small bird by a single squeeze. They make a curious clattering noise with their great mandibles, and also emit at times a harsh cry. They live chiefly in the depths of the South American forests, in small flocks. They are easily tamed, and bear cold climates well. In captivity, they readily eat rice, bread, potatoes, eggs, and many other kinds of food. They are remarkable among birds for regurgitation of food, in order to a kind of mastication in the great bill, analogous to rumination in quadrupeds. The colors of the bill are, in most of the species, very brilliant dur-

ing life, but disappear from stuffed specimens in museums. The largest species, *ramphastos toco*, are about 24 in. in length, the bill in this species measuring $7\frac{1}{2}$ in., and the tail 10 inches. See *illus.*, AMERICA, vol. I.

TOUCH is the sense through which we take cognizance of the palpable properties of bodies. It is used in two senses. In its extended acceptance, it implies, says Dr. Carpenter, "our consciousness of *all* those sensory impressions which are neither olfactive, visual, auditory, nor gustative: and it is therefore designated as the *general sense*, in contradistinction to those which are considered as *special senses*. In its limited application, on the other hand, it is used to designate that modification of the general sensibility which is restricted to the tegumentary surface, or to some special portion of it, and which serves to excite definite ideas in our minds respecting the form, size, number, configuration, weight, temperature, hardness, softness, etc., of objects brought within its cognizance."—Article "Touch," in *Cyclopedia of Anatomy and Physiology*, vol. iv. p. 1163. In the article **SENSIBILITY**, we have briefly noticed touch in its general sense; and we shall here confine ourselves to the investigation of the sense of touch in its limited application, as exercised by the organs specially adapted for the reception of tactile impressions.

The special organs of touch are the papillæ, which are figured and very briefly noticed in the article **SKIN**. These papillæ are more elevated and numerous on the palmar surface of the ends of the fingers than on any other part of the skin (although they are still larger on the tongue). They have an average length in man of $\frac{1}{10}$ of an inch. Their surface, after the removal of the epidermis, appears, from the investigations of Todd and Bowman, to be composed of the basement membrane of the cutis itself; their interior is composed of fibrous tissue, vessels, and nerves. In each papilla is a small arterial twig, which, entering at the base, subdivides into capillary vessels, which form loops, whose convexity lies in the papillary summit. The vascularity of the papillæ is so great, that their presence and relative size may be determined simply by the depth of the color imparted to the skin by a good injection of its vessels. Hence, as a general rule, the vascularity of the integument is proportioned to its perfection as an organ of touch. With regard to the mode in which the nerves terminate, there is still considerable doubt. According to Todd and Bowman, it is often impossible to detect any nerves at all within the papillæ, when such were plainly visible at their base; and they incline to the belief, that the nervous tubules, either entirely, or in a great measure, lose the white substance when within the papillæ.

In the lower animals, as in man, the papillæ are especially developed in those parts of the outer surface which are especially endowed with tactile sensibility. For the following illustrations of this statement, drawn from comparative anatomy, we are indebted to Dr. Carpenter: "In the quadrumana generally, both the hands and feet are thickly set with papillæ, and in those which have a prehensile tail, the surface of this organ possesses them in abundance. In the carnivorous and herbivorous mammalia, whose extremities are furnished with claws, or encased in hoofs, we find the lips and the parts surrounding the nostrils to be the chief seat of tactile sensibility, and to be copiously furnished with papillæ; this is especially the case with those which have the lips or nostrils prolonged into a snout or proboscis—as in the pig, the rhinoceros, the tapir, and the elephant. In the mole, too, the papillary structure is remarkably developed at the extremity of the snout. The only part of the skin of birds on which tactile papillæ have been discovered is on the under surface of the toes, and on the web of the palmipeds, where they obviously receive impressions which guide the prehensile and other movements of the feet. In many lizards, a papillary structure is found on the under surface of the toes; and in the chameleon, it exists also on the integument of its prehensile tail. . . . In serpents and chelonians (tortoises), no papillary apparatus has as yet been detected; and in fishes and invertebrata, its presence has not been ascertained, although it would appear that certain parts, especially the tentacles around the mouth, are endowed with a high degree of tactile sensibility." *Op. cit.*, p. 1166. It is probable that in all animals which have a soft fleshy tongue furnished with papillæ, this organ is an instrument of tactile sensibility as well as the organ of taste. Besides the papillary apparatus, certain animals have special organs of touch, constructed on a totally different plan, and "consisting of a rod or filament, which is in itself insensible, but which is connected at its base with nervous fibers in such a manner that any motion or vibration communicated to it must be transmitted to them." The so-called "whiskers" of the cats and certain rodents, as the hare and rabbit, belong to this class; and it has been proved, experimentally, that if they be cut off, the animal loses, to a great extent, its power of guiding its movements in the dark.

Among the conditions necessary for the exercise of the sense of touch are (1) a normal condition of the papillary apparatus and of the nerves supplying it; (2) a due supply of blood to the tactile organs; and (3), as has been noticed in the article **TASTE**, a temperature not too far removed from the natural heat of the body. It has been shown by prof. Weber, that, if the fingers or the lips be immersed for half a minute or a minute in water heated to 125°, or cooled to 32°, the power of distinguishing between a hot or cold fluid or solid body is for the time completely lost, a feeling of pain alone being

experienced. The result was the same on applying cold to the trunk of a nerve, the ulnar nerve at the elbow, where it lies just beneath the skin, being selected for the experiment. The fingers supplied by this nerve soon lost the power of distinguishing between heat and cold, and could only imperfectly perceive the contact and pressure of bodies.

The above-named physiologist has made a large number of experiments on the general subject of touch. His investigations regarding the tactile discrimination in different parts of the skin have been noticed in the article SENSIBILITY. Prof. Valentin, whose results, on the whole, correspond very closely with those of Weber, found, however, a considerable extent of individual variation, some persons being able to distinguish the separate compass-points at half or even one-third of the distances required by others.

There is no sense which is so capable of improvement as that of touch. Of this power of improving the delicacy of touch, says Dr. Carpenter, "we have examples in the case of certain artisans, whose employments require them to cultivate their tactile discrimination; thus, the female silk-throwsters of Bengal are said to be able to distinguish by the touch alone *twenty* different degrees of fineness in the unwound cocoons, which are sorted accordingly; and the Indian muslin-weaver contrives by the delicacy of his touch to make the finest cambric in a loom of such simple construction that European fingers could at best propose to make a piece of canvas at it." The highest degree of tactile sensibility is met with in blind persons—a circumstance which is to be attributed for the most part to the concentration of the attention and of the powers of recollection and comparison which are brought to bear upon the mind; and probably to some extent to an increased development of the tactile organs themselves, resulting, as the above-named physiologist suggests, "from that augmented nutrition which would be the natural consequence of the frequent use of them, and of the increased flow of blood that seems to take place toward any part on which the attention is constantly fixed."—For much interesting information on this subject, the reader is referred to Dr. Kitto's *Lost Senses*, in which cases, apparently quite authentic, are given of blind persons being able to distinguish colors by the touch.

TOUCH-HOLE, or VENT. See GUN.

TOUCH-PAPER. See NITER.

TOUCH-STONE, a hard black stone, occasionally used in assaying. The best kind is a peculiar bituminous quartz obtained from Lydia, in Asia Minor; but black basalt may be employed. The process is as follows: A series of "needles" or small bars are formed, the first consisting of pure gold; the second, of 23 of gold and 1 of copper; the third, of 22 of gold and 2 of copper, and so on. The assayer selects one of these alloys, or "needles," which, from its color, he judges to approach nearest in composition to the alloy which he is about to assay. This he rubs on the stone, and the streak which it leaves is red in proportion to the copper that is present. The streak formed by the alloy to be assayed is then compared with that formed by the various "needles," and corresponding streaks indicate corresponding amounts of copper. Hence, an approximate estimate of the amount of copper in an alloy can be made.—See Miller's *Inorganic Chemistry*, 2d ed., p. 739, note.

TOUCH-WOOD is the wood of willows and some other trees softened by decay. It is used as tinder for obtaining fire, from the readiness with which a spark ignites it.

TOUL, a fortified t. of France, dep. of Meurthe-et-Moselle. On Sept. 23, 1870, this fortress surrendered to the Germans after a bombardment of three days' duration. It has an old cathedral, which took more than five centuries to finish (965–1496), and which is reckoned one of the most splendid in France. Earthenware manufactures are carried on. Pop. '91, 12,138.

TOUL, or TULA, one of the provinces of Great Russia, bounded on the n. by the government of Moscow. Area, 11,954 sq.m.; pop. '94, 1,560,704. The surface is for the most part level; the climate is temperate; the soil fertile. The Oka is the only river which is navigable throughout the government, and the other streams are tributaries either of the Oka or the Don. The surface is in general dry, there being no lakes or marsh lands, and forests are rare. The inhabitants are occupied chiefly in agriculture, cattle-breeding, the manufacture of pottery, fishing, and the working of iron mines.

TOULA, or TULA, an important manufacturing t. of Great Russia, capital of the government of the same name, on the Upa, an affluent of the Oka, 110 m. s. of Moscow. Its churches, its arsenal, theater, industrial museum, cathedral, and the ancient Kremlin are the principal buildings. Toul is an ancient town, and has suffered severely from Tartar invasion, and during the wars of the commencement of the 17th century. Iron-works founded here under Czar Alexis Michailovitch have acquired a well-merited reputation. The Russian army is largely supplied with muskets and small-arms from the works of this town. Cutlery, locks, tea-urns, and bells are made in great perfection; and bristles are prepared in large quantities both for home consumption and export. There are also breweries and distilleries. Pop. '97, 111,048.

TOULMIN, JOSHUA, D.D., 1740–1815; b. London; became pastor of a dissenting congregation in Colyton. In 1765 he accepted a call from a Baptist congregation in Taunton. He then became a Unitarian, and received the degree of D.D. from Harvard

college in 1794. In 1804 he became minister of a Unitarian congregation at Birmingham. He published *Memoirs of Faustus Socinus* (1777); *Dissertations on the Internal Evidences of Christianity* (1785); and a *Historical View of the State of the Protestant Dissenters in England under King William* (1814).

TOULON, a great sea-port and naval arsenal of France, in the dep. of Var, stands on the shore of the Mediterranean, 42 m. e.s.e. of Marseilles, with which it is connected by railway. It stands at the head of a deeply penetrating inlet or gulf, rises in the form of an amphitheater toward the n., where its ramparts extend to the foot of a chain of lofty elevations, in part clothed with beautiful forests. The port is divided into two parts, the old and the new; the former, on the e., appropriated to merchant vessels, and bordered by a quay; the latter, on the w., surrounded by the dockyard, slips, arsenal, storehouses, cannon-foundry, etc. Numerous forts defend the town on the land-side; and the mouth of the harbor, and the hills commanding it, are studded with forts and redoubts; while moles, hollow and bomb proof, and formed externally into batteries, level with the water's edge, separate the roadstead from the old and new ports. Belonging to the arsenal, which is perhaps the finest in France, the chief objects of attraction are the sail-yard, the armory, the museum, the magazine, and the basin for the repair of ships. The fortifications of the town have been greatly extended since the conquest of Algeria, Toulon having become the chief port of communication with Africa. The population has also greatly increased, and two new suburbs have been constructed. The town is surrounded by a double rampart, and by a wide and deep fosse. The streets are straight and wide; and, on the whole, the town is both agreeable and healthy. The town is the Plymouth of France; and its industry consists, for the most part, of those manufactures to which its position as a great naval arsenal gives rise. Pop. '96, 95,276.

Toulon was destroyed by the Saracens in 889, and again by the Saracens about the close of the 12th century. It is only at the end of the 16th c. that Toulon comes to be important as a naval and military stronghold. It was taken by the English and Spaniards in 1793; but the allies were obliged to evacuate the town in December of the same year, after being fiercely attacked by the republicans, whose guns were commanded by Napoleon—then a simple officer of artillery—who here evinced for the first time his genius and self-reliance.

TOULOUSE (anc. *Tolosa*), an important city in the s. of France, capital of the dep. of the Haute-Garonne, is situated in a broad and pleasant plain, on the right bank of the river Garonne, 160 m. by railway s.e. of Bordeaux. Pop. '96, 149,963. The *canal du Midi* sweeps round its eastern and northern sides. The Garonne is here crossed by a beautiful bridge upward of 810 ft. in length, and 72 broad, which connects Toulouse with the suburb of St. Cyprien. The city, with the exception of the southern faubourg, is not particularly handsome (though the broad quays have rather an imposing appearance), and there are few fine public buildings. One may note, however, the cathedral, containing the tombs of the counts of Toulouse; the *capitole*, or town-hall; the church of St. Sernin (1090 A.D.); the musée, with its interesting collection of antiquities, forming an almost uninterrupted chain in the history of art, from the Gallo-Roman to the renaissance period. Toulouse is the seat of an archbishop, has a university academy, an academy of "floral games" (*société des jeux floraux*), pretending to derive its origin from the contests of the ancient troubadours, academies of arts, sciences, antiquities, etc., schools of law, and medicine, and artillery, a national college, an observatory, a museum, botanic garden, and a public library of 70,000 volumes. Toulouse manufactures woollens, silks, leather, oil, candles, soaps, machinery, paper, tobacco, etc., and carries on a great trade with Spain. There are fairs annually.

History.—*Tolosa* was, in Cæsar's time, a city within the limits of the Roman *provincia*, and had been originally the capital of the Volcæ Tectosages, a Gallic tribe noted for its wealth and consequence. Under the empire its importance continued. Ausonius describes it as surrounded by a brick wall of great circuit, and so populous that it had founded four colonies. In 412 A.D. the Visigoths made it the capital of their kingdom; and after the time of Charlemagne, it was under the sway of counts, who made themselves independent about 920, but in 1271 the "county of Toulouse" was reunited to the crown of France by Philippe le Hardi. Its literary celebrity reaches as far back as the Roman empire. Ausonius speaks of the *toga docta* of "Palladian" Tolosa, and the favorite deities of the city were Jupiter, Minerva, and Apollo. At a little village close by, which still bears the name of *Viel Toulouse*, a multitude of cinerary urns, statuettes, Phœnician, Celtiberian, Gallic, Greek, and Roman medals, fragments of buildings, and an entire paved street have been discovered. Early in the middle ages, under the counts of Toulouse, it became a seat of provençal poetry, and was the center of the papal crusade against the Albigenses, conducted by Simon de Montfort. The parliament of Toulouse had also a great reputation, but unhappily it is likely to be best remembered by one of its most iniquitous decisions, that delivered in the case of the Calas (q.v.) family.

TOURAINÉ, one of the former provinces of France, of which the capital was Tours (q.v.), and which was bounded on the n. by the province of Orleannais, on the e. by Berri, on the s. by Poitou, and on the w. by Anjou. It was about 60 m. in length, and nearly the same number of miles in breadth, and consisted of the present department of Indre-et-Loire and a portion of Vienne.

TOURCOING, a frontier t. of France, dep. of Nord, $7\frac{1}{2}$ m. n.e. of Lille, is built on an eminence in the midst of a fertile territory. It has a great reputation for its manufacture of linen cloths, silks, and woollens, and also carries on sugar-refining, distilling, and manufactures of soap, colors, etc. Pop. '91, 65,477.

TOURGEE, ALBION WINEGAR, b. Ohio, 1838; educated at the university of Rochester, N. Y.; studied law; was in the army in the war of the secession, 1861-65; was twice wounded; practiced law at Greensboro', N. C., after the war; was a member of the convention of southern loyalists held in Philadelphia, 1866. He aided in preparing *A Code of Civil Procedure for North Carolina*, and he has also published some widely circulated works—*The Fool's Errand*; *Bricks Without Straw*; *Figs and Thistles*; *John Eax*; *An Appeal to Cæsar*; *Pactolus Primus* (1890); *An Outing with the Queen of Hearts* (1894). He edited *Our Continent*.

TOURMALINE, a mineral ranked among gems (q.v.), and occurring in primitive rocks in many parts of the world. Its chemical composition is very complex and somewhat various, but the chief constituents are always silica and alumina in about equal proportions, and forming about three-fourths of the whole; the remainder consisting of boracic acid, fluorine, phosphoric acid, peroxide of iron, peroxide of manganese, protoxide of iron, magnesia, lime, soda, potash, and lithia, which are not, however, all present in any specimen. Tourmaline is harder than quartz, but not so hard as topaz or emerald. Its specific gravity is a little more than 3. It occurs in crystals, or massive and disseminated, although always crystalline. Its luster is vitreous. Some varieties are transparent, some translucent, some opaque. Some are colorless, some green, brown, red, blue, and black. Red tourmaline is known as *rubellite*, blue tourmaline as *indicolite*, and black tourmaline as *schorl*. This last is the most common kind. Tourmaline crystallizes in prisms, with 3, 4, or 9 sides, variously acuminate. The sides of the prisms are striated. The finest tourmalines are much valued by jewelers, but are comparatively rare. They mostly come from Ceylon, Siberia, and Brazil. Tourmalines are found in several parts of Britain. Very large crystals abound in the granite of Aberdeenshire. Fine specimens are found in Maine, North Carolina, and other parts of the U. S.

TOURNAMENT (Fr. *tournoi*, from *turnoyer*, to turn round), a military sport of the middle ages, in which combatants engaged one another with the object of exhibiting their courage, prowess, and skill in the use of arms. The invention of the tournament has been ascribed to Geoffroy de Prenilly, ancestor of the counts of Anjou, who lived in the 10th c.; France was its earliest *locale*, whence it spread first to Germany and England, and afterward to the s. of Europe. A tournament was usually held on the invitation of some prince, who sent a king-of-arms or herald through his own dominions and to foreign courts signifying his intention of holding a tournament and a clashing of swords in presence of ladies and damsels. The intending combatants hung up their armorial shields on the trees, tents, and pavilions around the arena for inspection, to show that they were worthy candidates for the honor of contending in the lists in respect of noble birth, military prowess, and unspotted character. The combat took place on horseback, or at least was always begun on horseback, though the combatants who had been dismounted frequently continued it on foot. The usual arms were blunted lances or swords; but the ordinary arms of warfare, called arms *à l'outrance* were sometimes used by cavaliers who were ambitious of special distinction. Tournaments were the subject of minute regulations, which in some degree diminished their danger. The prize was bestowed by the lady of the tournament on the knight to whom it had been adjudged, he reverently approaching her, and saluting her and her two attendants. The period when tournaments were most in vogue comprised the 12th, 13th, and 14th centuries; and the place where the most celebrated English tournaments were held was the tilt-yard, near St. James's, Smithfield, London. The church at first discountenanced tournaments, some of its decrees prohibiting persons from engaging in them under pain of excommunication, and denying Christian burial to a combatant who lost his life in one. The church seems, however, to have looked with more favor on these combats after the middle of the 13th century. During the 15th and 16th centuries, tournaments continued to be held, but the alteration in the social life and warfare of Europe had changed their character, and they are rather to be regarded as state pageants than as real combats. The death of Henry II. of France, in 1559, consequent on the loss of his eye at a tournament, led to their general abandonment, both in France and elsewhere, and there have been few attempts to revive them even as mere spectacles. A magnificent entertainment, consisting of a representation of the old tournament, was given at Eglinton castle in 1839, by the late earl of Eglinton: lady Seymour was the queen of beauty, and many of the visitors enacted the part of ancient knights; among them Prince Louis Bonaparte afterward Napoleon III.—According to Ducange, the difference between a tournament and a Joust is that the latter is a single combat, while in the former a troop of combatants encounter each other on either side. But this distinction has not been always observed.

TOURNAY (Flemish, *Doornik*), a fortified t. of Belgium, province of Hainault, on both sides of the Scheldt, near the French frontier. It has a splendid cathedral with five towers (and pictures by Jordaens, Rubens, Gallait, etc.), several fine churches, particularly St. Quentin and St. Jacques, a gallery of art, an episcopal seminary, hos-

pitals, and a lunatic asylum. Although one of the oldest towns in Belgium, it has quite a modern appearance, with fine suburbs and beautiful broad streets. The chief manufactures are hosiery and linen, carpets, liqueurs, and porcelain; but there are few large workshops, most of the fabrics being executed by the people in their own houses. Pop. '95, 35,761. A little to the s.e. lies the famous village of Fontenoy (q. v.).

Tournay, the ancient *Tornacum* or *Turris Nerviorum* (''fort of the Nervii''), was in the 5th and beginning of the 6th c. the seat of the Merovingian kings, subsequently belonged to France, but at the peace of Madrid was included in the Spanish Netherlands. Subsequently, it was oftener than once taken by France, but again restored by treaty. During the month of May, 1794, it was the scene of several hotly contested fights between the French and Austro-English armies, the most important of which was that of May 19, in which Pichegru beat the duke of York.

TOURNEFORT, JOSEPH PITTON DE, one of the greatest botanists of the 17th c., b. at Aix, in Provence, in 1656. He exhibited an ardent love of botany from his youth, and devoted his whole life to this science. After having explored the flora of his native district, he was sent, at the king's expense, to Spain, Portugal, England, and Holland, and afterward to the east. He visited the Grecian archipelago and Thrace, the shores of the Black sea, and Asia Minor, and added a great number of species to the list of known plants. He lost his life in 1708, in consequence of a carriage running against him in Paris. He published several botanical works, and a *Voyage to the Levant* (1717). His botanical system, which maintained its ground till the time of Linnæus, was of great use in promoting the progress of botany; but he rendered still greater service to his favorite science by grouping plants in genera. He was the first to do so. Previous botanists had merely described them individually, as species.

TOURNIQUET, an instrument for compressing the main artery of the thigh or arm, either for the purpose of preventing too great a loss of blood in amputation, or to check dangerous hemorrhage from accidental wounds, or to stop the circulation through an aneurism.

The common tourniquet consists of three parts—viz., (1) a pad to compress the artery; (2) a strong band which is buckled round the limb; and (3) a bridge-like contrivance over which the band passes, with a screw whose action raises the bridge and consequently tightens the band. The best kind of pad is a small firm roller about an inch thick; it must be placed lengthways over the main artery so as to compress it against the bone, and must be secured in its place by a turn of bandage, over which the band of the tourniquet must be applied. This band must first be tightly buckled, and the pressure must be then increased to the necessary extent (namely, till the beating of the artery beyond the instrument ceases to be perceptible) by the action of the screw, which should always be opposite the buckle of the band. As the instrument arrests the venous blood, it should never be applied tightly in cases of amputation, until the surgeon is ready to make his incision, as otherwise there would be an excessive loss of venous blood.

The credit of the invention of this most useful instrument is usually ascribed to the French surgeon, Morel, who, in 1674, used a stick passed beneath a fillet, and turned round so as to twist it up to the requisite degree of tightness, as a means of preventing the undue loss of arterial blood in amputations of the limbs—a rough, but by no means ineffectual form of tourniquet, which may often be usefully extemporized in cases of emergency at the present time. Mr. Young, of Plymouth, in 1679, described a similar apparatus. A much improved screw tourniquet was invented by Petit early in the following century.

TOURO, JUDAH, 1775–1854; b. Newport, R. I., son of Isaac Touro, rabbi of the synagogue at Newport (1762), who emigrated from Holland. He went to the Mediterranean in 1798 as supercargo in his uncle's vessel, which on its passage had an engagement with a French privateer and gained the victory after a desperate battle. On his return he resided some time in Boston; removed to New Orleans, 1802, amassing a large fortune in trade, which he used beneficently, bequeathing much of it to public institutions in that city. The Touro almshouse, one of his gifts, used as barracks for colored troops during the civil war, was destroyed by fire. He was wounded in the hip at the battle of New Orleans, 1815, and never recovered from the ill effects. He was an Israelite, but gave liberally in money and land to other denominations and their enterprises. He gave \$10,000 to the Bunker hill monument association.

TOUROUKCHANSK, a small t. of e. Siberia, in the government of Yeneseisk, stands on the Yenesei, 4,122 m. e. of St. Petersburg, and only 50 m. s. of the arctic circle.

TOURS, a city of France, capital of the dep. of Indre-et-Loire, and formerly capital of Touraine, stands in the midst of a fertile but flat valley, 147 m. s.w. of Paris. Along its n. side runs the Loire, and along its s. side the Cher—these two rivers uniting about 25 m. s.w. of the city, between which and their point of confluence only a very narrow strip of land separates them. The bridge over the Loire, which continues the great highway from Paris s. to Bordeaux, is upward of 1400 ft. long. The cathedral is a stately Gothic edifice. Surrounding the choir—begun in 1170—there is beautiful old

painted glass. The Tour de St. Martin or d'Horloge, and the Tour de Charlemagne, are noteworthy as being the only remains of the cathedral founded by St. Martin in the 4th century. The church was pillaged by the Huguenots, and utterly destroyed, with the exception of the two towers mentioned, at the revolution. Tours has a town hall, a library, and a museum. A little to the w. of Tours are the remains of Plessis les Tours, in which Louis XI. died in 1483. Manufactures of silk stuffs, carpets, confectionery, painted glass, and pottery are carried on. Pop. '96, 83,267.

Tours, the ancient *Cæsarodunum*, dates from the time of the Gauls, and was visited by Cæsar and by Adrian. Here Clovis, having come to thank St. Martin for the victory of Vouillé, received the crown of gold and the purple robe presented to him by the emperor Anastasius. Henry IV. planted the first mulberry-trees known in France here, and here the first silk-factories were established. Under Richelieu, 40,000 hands were employed at Tours, in this branch of manufacture; but the industry of the town was ruined by the revocation of the edict of Nantes. In the Franco-German war of 1870-71, Tours was for a time the seat of the French provisional government, and was occupied by the German troops.

TOURVILLE, ANNE HILARION DE COTENTIN, Count de, third son of César de Cotentin, seigneur de Tourville, was born at Tourville in 1642. Entering the French navy when, about eighteen, it seems that his somewhat delicate and effeminate appearance caused him to be regarded as anything but a hopeful seaman. He became, however, almost immediately conspicuous for bravery and enterprise; and the first six years of his naval service, directed against the Turks and Algerians, established his reputation both in France and in the south of Europe. In 1667, he was received at Versailles with great distinction by Louis XIV. In 1669, he distinguished himself in the expedition sent by France to the relief of Candia, then besieged by the Turks; and again in 1671-1672, in the naval war waged by the combined fleets of France and England against the Dutch. In 1682, he was made lieut. gen. of the navy, and for the following two or three years he was engaged in suppressing the pirates of Algiers and Tripoli. In the war which broke out after the English revolution of 1688, between France on the one part, and England and Holland on the other, Tourville was put at the head of the French navy. In June 1690, he entered the English channel at the head of a powerful fleet, and inflicted a disastrous and ignominious defeat on the united English and Dutch armament near Beachy Head. "There has scarcely ever been so sad a day in London," says Macaulay, "as that on which the news of the battle of Beachy Head arrived." Tourville ranged the channel unopposed; and on July 22, his fleet cast anchor in Torbay (see Macaulay, *History of England*, vol. iii. p. 652-54, ed. 1855). In 1692, Louis XIV. having resolved to invade England on behalf of James II., an immense fleet was assembled at Brest under Tourville in order to protect the descent. On the 16th May of this year the French fleet was descried from the cliffs of Portland, and on the following morning the English and Dutch force stood out to give battle. From the morning of the 19th to the afternoon of the 24th, raged one of the greatest naval battles of modern times that of cape La Hogue. It ended in the complete defeat of the French, 16 of their men-of-war being utterly destroyed. In spite of this disaster, Tourville was graciously received at Versailles: "We have been beaten," said Louis to him, "but your honor and that of the nation are unsullied" (see *Memoirs of St. Simon*). On March 27, 1693, Tourville was made a marshal of France. Sailing from Brest harbor in the spring of this year, he attacked an English merchant fleet under inadequate convoy, and succeeded in inflicting a damage on English traders estimated at some millions sterling. Sir George Rooke, who commanded the convoy, had some difficulty in saving his own squadron from destruction. This was the last exploit of the great French admiral; his career ending with the peace of Ryswick in 1697. He died at Paris, May 28, 1701. It has been said of Tourville that he was competent to fill any place on board ship, from that of carpenter to that of admiral. It has also been said of him, that to the dauntless courage of a sailor he united the suavity and urbanity of an accomplished gentleman. But though a brave man, he was, during the earlier part of his career, a timid commander. Reckless of his life, he was often pusillanimously cautious where his professional reputation was at stake. Latterly, stung by the censures drawn on him by his natural disposition, he became bold even to rashness.

TOUS-LES-MOIS, a starch made in the West Indies, from the roots of a species of canna (q. v.); it is used as a substitute for arrow-root.

TOUSSAINT, ANNA LOUISA GERTRUDE, one of the most popular modern Dutch novel ists, was b. at Alkmaar, Sept. 16, 1812, where her father, a highly esteemed lecturer on chemistry, died in 1859. After the revocation of the edict of Nantes, her paternal ancestors fled from France, and took refuge, first at Hanau, and later in Friesland, where they ranked among the nobility, but were reduced in circumstances during the French usurpation. By the mother's side, she was also of a refugee family of the name of Rocquette, belonging to the higher class of merchants and manufacturers. Her first work, *Almagro*, published in 1837, was well received, and translated into German. Speedily followed *De Graaf van Devonshire*, an episode in the early life of Elizabeth Tudor; then *De Engelschen te Rome*, a historical novel of the times of Pope Sixtus V.; in 1840, the *Iluis Laurenessé*, a story of the reformation, which has gone through several

editions, and been translated into German and English. Her popularity was increased by a series of novels in 10 volumes, 1845-55, under the titles of *De Graaf van Leycester in Nederland* (The Earl of Leicester in the Netherlands), *De Vrouwen van het Leycestersche tijdperk* (The Women of the Times of Leicester), and *Gideon Florentz*. Her other works are numerous, including *Cardinal Ximenes*, *The Duke of Alba in Spain*, *The Princes Orsini*, *De Mauléon*, *Don Abbondio II.*, *Mother-joy and Mother-grief*, *The Orphan of Alkmaar*, *The Leyden Student in 1593*, *The Biography of the Landscape Painter Maria van Oosterwijk*, etc. She married the painter Johannes Bosboom in 1841.

TOUSSAINT, FRANÇOIS DOMINIQUE, surnamed L'OUVERTURE, was b. at Buda, in St. Domingo in 1743. His father and mother were both African slaves. When the French revolution broke out, it found him in the position of coachman to a M. de Libertat, who appears also to have employed him as a sort of sub-manager of an estate for which he was himself the factor. In 1791 the French convention passed the memorable decree, by which the rights of French citizens were given to people of color. In the revolutionary strife which followed in St. Domingo, Toussaint was, for the next three years, conspicuous for his adherence to the cause of royalty and Catholicism; but the decree of Feb. 4, 1794, which declared all slaves free, won him over to the side of the French republic. He joined their commander, Laveaux, by whom he was made a gen. of division. In 1793, in the midst of the troubles, the British had landed a force and taken partial possession of the island. Against them Toussaint now proved himself an able and indefatigable enemy, bringing the whole of the northern division of the island under the dominion of the French republic. In 1795, in consequence of a conspiracy of three mulatto generals, Laveaux was arrested at Cape Town; but Toussaint, assembling his negroes, and uniting himself to the French force, quickly effected the release of the governor. The gratitude of Laveaux was very great; and, in 1796, the commissioners of the directory appointed Toussaint chief of the army of St. Domingo. Shortly after this event, Gen. Maitland, the British commander, surrendered to him all the strong places which he had hitherto held in the island. This was followed in 1801 by the submission of the Spanish forts. The whole of St. Domingo was then under the rule of Toussaint. His sway was vigorous and upright; and the agriculture and trade of the island both flourished under him. He was now at the summit of his prosperity. He assumed great state, though still retaining habits of personal simplicity. But a more powerful despot now found himself at leisure to interfere in the affairs of the island. During the peace of Amiens, Napoleon Bonaparte issued a proclamation re-establishing slavery in St. Domingo. This was met by a counter-proclamation by Toussaint, issued on Dec. 18, 1801, in which, while professing obedience, he showed plainly that he meant resistance. A squadron of 54 sail of the line, under Gen. Le Clerc, very soon made its appearance to enforce the edict of the first consul. Toussaint was obliged to retire, was proclaimed an outlaw, and, agreeing to surrender, was received with military honors. He was afterward treacherously arrested, and sent to Paris, where, after 10 months of rigorous imprisonment, he died on April 27, 1803.—See *Vie de Toussaint l'Ouverture* by St. Remy (Par., 1850); and *The Life of Toussaint*, by Dr. Beard (Lond., 1853).

TOUT ENSEMBLE (Fr., "all together") is a current term denoting the general effect produced by a whole. In a work of art the *tout ensemble* is the effect of the work considered as a whole, without regard to the execution of the separate parts; of a face it is the impression, which the face produces, without regard to special or separate features; of a toilet it is the final effect, without regard to detail or arrangement.

TOWER HAMLETS, a parliamentary borough in Middlesex, lying in the e. of London, and having the city and Finsbury to the w. of it. It contains the parishes of St. George, Mile-End, Poplar, Stepney, Limehouse, Bow, Bromley, and Whitechapel. In Tower Hamlets are the Tower of London (q.v.), the mint, Trinity house, St. Katharine's docks, the East and West India, South and London docks, the London hospital, and various charitable institutions. Six members are returned to Parliament. Pop. '91, 451,931.

TOWER, ZEALOUS BATES, b. Boston, 1819; appointed to the engineers in the U. S. army in 1842, after graduating at West Point, where he was for a time assistant prof. of engineering. He served through the Mexican war, receiving several brevets for his conduct at Cerro Gordo, Contreras, Churubusco, and Chapultepec. At the beginning of the civil war he was chief engineer at Fort Pickens, Florida. He served in the campaign in northern Virginia in 1862, and was wounded in the second battle of Bull Run, where he commanded a brigade. He was chief engineer of the fortifications of Nashville, Tenn., 1864-65; and took part in the battle of Nashville. He was brevetted maj.gen. in 1865; made col. engineers 1874; retired 1883.

TOWER OF LONDON, in feudal days, a powerful fortress; then, and long after, a state prison of gloomy memories; now, a government storehouse and armory, and still, in some sense, a stronghold, is an irregular quadrilateral collection of buildings on rising ground adjoining the Thames, and immediately to the e. of the city of London. The space occupied is between 12 and 13 acres, and the whole is surrounded by a moat of fair width, but no great depth. Usually the moat is dry, but the garrison have the power of flooding it. Seen from without, the moat is bordered within by a lofty castellated wall, broken by massive flanking-towers at frequent intervals. Within this wall

risers a second of similar construction, but greater height; and within this, again, are the several barracks, armories, etc.; and in the center of all, the lofty keep or donjon known as the white tower. This last, which nearly resembles Rochester castle, and like it, was built by Gundulph, bishop of Rochester, in the time of William the Conqueror, is the center of interest and antiquity in the whole structure. Its walls are in parts 16 ft. thick, and of solid masonry. This tower was the court of the Plantagenet kings. The various other towers are principally noteworthy on account of the illustrious prisoners who have pined in them, or left them for the scaffold. In the n.w. corner of the quadrangle is St. Peter's chapel, now the garrison church. In another part is the jewel-house, containing the crown jewels, or *regalia*, comprising several crowns, scepters, globes, and jewels of enormous value. Near this building is the horse-armory a collection of ancient and mediæval arms and armor, the latter being exhibited in complete suits on wooden figures of men and horses. To the crown jewels and the armory, visitors are admitted on payment of a small fee.

Early writers have alleged that Julius Cæsar first built the tower of London as a Roman fortress; but there is no written evidence to prove the existence of any fortress on this site before the construction of the white tower by bishop Gundulph in 1078. Some earlier structure of the Saxon times appears to have been there, from the massive foundations which have been discovered in the course of subsequent erections; but of the nature of those buildings we know nothing. During the reigns of the first two Norman kings, the tower seems to have been used as a fortress merely. In Henry I.'s time, it was already a state prison. That monarch and his successors gradually increased the size and strength of the ramparts and towers, until the whole became a stronghold of the first class for feudal times. The kings frequently resided there, holding their courts, and not unfrequently sustaining sieges and blockades from their rebellious subjects. Of the long list of executions for political offenses, real or imputed, that of lords Kilmarnock, Balmerino, and Lovat, after the rebellion of 1745, was the last. Wilkes, Horne Tooke, and others have since been confined there; but happily, blood has ceased to flow since the existence of a living opposition has been found consistent with the safety of the government.

Not the least interesting memorials are the quaint and touching inscriptions cut by hapless prisoners on the walls of their dungeons.

In 1841 a very serious fire broke out in the bowyer tower, and extended to the armories, causing the destruction of numerous modern buildings and many thousand stand of arms. At present, the tower of London is a great military storehouse in charge of the war department, containing arms and accouterments for the complete equipment of a large army. The mint and public records were formerly kept in it, but have now been removed to other buildings more suitable. Flamsteed, when first appointed astronomer-royal, made his observations from the summit of the white tower; afterward, he removed to Greenwich. It is needless to say that, viewed as a fortress, the tower would be useless against modern arms.

The government is vested in a constable, who has great privileges, and is usually a military officer of long service and distinguished mark; the deputy-constable, also a general officer of repute, is the actual governor. He has a small staff under him, and the corps of yeomen of the guard, more commonly known as beef-eaters. In addition, a wing, and occasionally a battalion, of infantry is quartered in the barracks.—*Bayley's History of the Tower of London*, 2 vols. 4to; *Memoirs of the Tower*, by Britton and Brayley (1831); *Memorials of the Tower of London*, by Lord De Ros (1866); *Her Majesty's Tower*, by Hepworth Dixon, 4 vols. (1871).

TOWLE, GEORGE MAKEPEACE, b. Washington, D. C., 1841; educated at Boston public schools, the academies of Lawrence, Groton, and Wrentham, Mass., and Yale college; graduated, 1861; Harvard law school, 1863. He was admitted to the bar and practiced law in Boston, 1863-65. In 1865-66 he was on the editorial staff of the *Boston Post*; U. S. consul at Nantes, France, 1866-68; at Bradford, England, 1868-70. Returning to this country, he became managing editor for one year of the *Boston Commercial Bulletin*. In 1871-76 he was foreign editor of the *Post*, and was afterwards on the regular staff of *Appleton's Journal*, the *Art Journal*, and the *Youth's Companion*. He began his literary work by writing essays for the *North American Review*. Among his later publications are *The Principalities of the Danube*; *Modern Greece*; *Montenegro and Bulgaria* (1877). He edited *Harvey's Reminiscences of Webster* in the same year, and published *Vasco da Gama* (1878). He was engaged on the third volume of his *Literature of the English Language* at the time of his death, August, 1893.

TOWN, in law, a term of somewhat varying signification. In ancient times a wall seems to have been necessary to constitute a town, and the Anglo-Saxon word *tun*, from which *town* is derived, came from a verb meaning to inclose. This suffix *tun* is found with very many names of places. In Pennsylvania and some other states the word town may mean either a city or village. In New York and Wisconsin the town is a subdivision of the county, and so in most of the western states, though the name township is more commonly used. In the New England states the town has a distinctly different position, and is a political division of the state—the unit of civil organization, and, legally speaking, a *quasi* corporation. See MUNICIPALITY—MUNICIPAL CORPORA-

TOWNS. Town governments cover all organized New England territory except that occupied by incorporated cities; and, with the exception of Massachusetts and Maine, the towns are the basis of legislative representation. Thus in Connecticut, the town of New Haven, pop. 86,045, and the town of Wolcott, pop. 522, have the same number of representatives in the lower branch of the legislature. The town officers (usually a town clerk, selectmen, a treasurer, assessors, poor overseers, school committee, and constables) are elected by the "town meeting," which also lays the taxes, and in other ways legislates for the town. This peculiarly democratic institution has fallen into a mere form in the larger towns, where there is usually a city charter. A curious assertion of its legal existence as late as 1881 occurred in Boston. The city charter of 1822 requires the common council to call a town meeting when requested so to do by, we believe, 40 respectable persons. Such petition was made by members of a "labor reform" society, and on refusal of the authorities to call the meeting, an order was obtained calling upon the "City of Boston" to come into court and show cause why a *mandamus* should not issue to compel the city to obey its charter.

TOWN-ADJUTANT, TOWN-MAJOR, officers on the staff of a garrison. They are often veteran officers, too much worn for field-service. The pay depends on the magnitude of the trust. The town-major ranks as a captain, the adjutant as a lieutenant. The duties of these officers consist in maintaining discipline, and looking after the finding of the batteries, etc.

TOWN-CLERK is the clerk to a municipal corporation, elected by the town council. In England, he holds his office during pleasure, and his salary is paid out of the borough funds. His duties are: to take charge of the voting papers in the election of councillors, to keep the records of the borough and lists of burgesses, and to perform a variety of miscellaneous duties imposed by sundry acts of parliament.—In Scotland, he holds his office *ad vitam aut culpam*, is the advisor of the magistrates and council in the discharge of their judicial and administrative functions, attends their meetings, records their proceedings, is the proper custodian of the records of the burgh, and keeper of the registers of sasines and deeds within it. Various important statutory duties are also assigned to him in relation to the registration of voters, the conduct of municipal elections, the valuation of lands and heritages, the registration of births, marriages, and deaths, the licensing of public houses, etc. In the performance of a large proportion of these duties, he is independent of the town-council, who cannot make his appointment during pleasure, or attach to it any condition which might enable the council either to control him in the conduct of the business of his office, or withdraw from him any portion of his emoluments, so far as derived from fees. Being thus protected in the independent and impartial discharge of his functions as a public officer, he is bound to give extracts from the records in his custody without reference to the town-council, and is liable *personally* for the consequences of failure in any department of his duty. He is not, however, a magistrate in any sense, and cannot be held responsible for the obligations of the burgh, or for the omissions or neglect of the magistrates and council.

TOWNER, a co. in n.e. N. Dakota, organized 1883; 1044 sq.m.; pop. '90, 1450. Co. seat, Cando.

TOWNE SCIENTIFIC SCHOOL. See PENNSYLVANIA, UNIVERSITY OF.

TOWNLEY, CHARLES, 1737-1805; b. England; educated on the continent. He lived in Rome 1765-72, and bought a large collection of antique statues, coins, bronzes, marbles, and manuscripts. In the purchase of antiques he was able to utilize the taste and knowledge of Winckelmann and other connoisseurs. After his return to England he continued to add to his collection, which is now in the British museum.

TOWNS, a co. in n.e. Georgia, adjoining North Carolina; drained by the Hiawassee river; about 180 sq.m.; pop. '90, 4064, chiefly of American birth, with colored. The surface is rugged and mountainous; there are extensive forests; corn, oats, and pork are the chief products. Co. seat, Hiawassee.

TOWNSEND, GEORGE ALFRED; b. Del., 1841; educated in Philadelphia. He was connected with the *Inquirer* and *Press* of Philadelphia, and during the war sent to the New York *Herald* a series of letters, describing the Peninsular campaign. The closing events of the war were reported by him in interesting letters to the New York *World*. After the war he traveled in Europe; wrote for English papers, and was correspondent of several in this country. On his return he acted as Washington correspondent for several papers under the pseudonym, *Gath*; was connected with the Chicago *Tribune* for some years, and now resides in New York, still in newspaper work. He has published collected correspondence; a volume of poems; a volume of stories of Maryland life; the novels, *Lost Abroad*; *The Entailed Hat* (1884); *Katy of Catoctin* (1886); *Mrs. Reynolds and Hamilton* (1890); and a drama, *President Cromwell* (1885).

TOWNSEND, LUTHER TRACY, D.D.; born Me., 1836; graduated Dartmouth, 1859, and Andover theological seminary, 1862; professor of practical theology in the Boston university (Meth. Episcopal). He has published *True and Pretended Christianity*; *Credo*; *Sword and Garment*; *God-Man*; *The Arena and the Throne*; *Lost Forever*; *Outlines of Theology*; *The Chinese Problem*; *Bible Theology and Modern Thought*. In 1893 he became pastor of a church in Baltimore.

TOWNSHEND, CHARLES, Viscount TOWNSHEND, English statesman, b. 1674; was descended from a very ancient English family, which has been settled at Raynham, in Norfolk, since the reign of Henry I. His father, Horatio, had been a prominent member of the Presbyterian party before the restoration, and having been one of the most forward in restoring the monarchy, was, by Charles II., made baron in 1661, and viscount in 1682. He died in 1687, when his son was only eleven years old. When he was of age to take his seat in the upper house, he adopted his father's politics; but soon afterward became a disciple of lord Somers, and cordially co-operated with the whigs. He was named by the Godolphin administration one of the commissioners for arranging the union with Scotland, and was rewarded for his exertion by the captaincy of the yeomen of queen Anne's guard. He was then employed as a diplomatist; was joint-plenipotentiary with Marlborough at Gertruydenberg; and negotiated with the states-general the barrier treaty, which pledged the states-general to the Hanoverian succession, and England to procure the Spanish Low Countries for the United Provinces, as a barrier against France. In 1712, upon the formation of the Harley ministry, Townshend was dismissed from his places, and the barrier treaty was censured by the house of commons, which voted that Townshend and all who had been concerned in the treaty were enemies to the queen and kingdom. This persecution raised him from the rank of a follower to the station of a leader. He maintained a close correspondence with the court of Hanover, and obtained the entire confidence of George I., who on his accession to the throne of England, made him his chief minister. While George I. was still at the Hague, on his way to his new kingdom, he made Townshend secretary of state, with power to name his colleague. He selected General, afterward Earl Stanhope, and formed a ministry entirely whig in its party character. He strengthened it by the addition of Walpole, who, from being at first paymaster of the forces, was soon made chancellor of the exchequer and first lord of the treasury. The principal act of the government was the passing of the septennial bill, a bold and unconstitutional act. After the breaking up of the South Sea bubble, and the deaths of Sunderland (q.v.), and Stanhope Townshend (1721) again became secretary of state. But he was no longer the acknowledged leader of the whigs. The superior talent of Walpole, his financial abilities, and his influence in the house of commons, caused a change in the relative position of the two ministers, and converted those who had been so long friends and colleagues, and who were also connected by ties of marriage (for Townshend had married Walpole's sister), into rivals and enemies. An open and unseemly quarrel broke out between them. They seized each other by the collar, and then laid their hands upon their swords. The interposition of friends prevented a duel; and Townshend, resigning the contest, retired to Raynham, to cultivate his paternal acres. Walpole, on being asked the cause of his difference with his brother-in-law, replied, "As long as the firm was Townshend and Walpole, all did very well; but when it became Walpole and Townshend, things went wrong, and a separation ensued." Townshend introduced the turnip into Norfolk from Germany, and thus effected a most beneficial revolution in agriculture. He steadily refused to reappear in public life, and died at a good old age, in June, 1738.

TOWNSHEND, The Right Hon. CHARLES, English orator and statesman, was second son of the third viscount Townshend, and grandson of the foregoing. He was born in 1725, and entered the house of commons in 1747, as a supporter of the Pelham (whig) administration. His first great speech was against the marriage bill in 1753, which gained him a great reputation for eloquence. Upon the dissolution of the whig government, the earl of Bute gained him by the offer of the post of secretary at war. On Bute's resignation in 1763, he was appointed first lord of trade and the plantations. By this time, the versatility of his political career had obtained him the appellation of "the Weathercock." In the Chatham ministry of 1766, he accepted the post of chancellor of the exchequer, and leader of the house of commons. When lord Chatham, in a distempered state of mind, abdicated the post of first minister, Townshend broke loose from all restraint, and manifested the greatest vanity, ambition, and arrogance. George Grenville, smarting under the defeat of his favorite scheme of taxing America, on one occasion, in the middle of his harangue, turned to the ministers: "You are cowards," he said; "you are afraid of the Americans; you dare not tax America." Townshend's fiery temper was kindled, and he exclaimed: "Dare not tax America! I dare tax America." Grenville retorted: "I wish to God I could see it!" and Townshend replied: "I will, I will." He was not allowed to forget his pledge; and finding the notion of an American revenue agreeable to the court, and not unpalatable to the house of commons, he proposed and carried those measures that led to the separation of the American colonies. Townshend's wife was created a peeress, and he was about to be intrusted with the formation of a ministry, when he was carried away by a putrid fever (Sept. 1767) in this 42d year. The difference between his contemporary reputation and his fame is very striking. He was ranked as an orator with Pitt. He was far more popular than the great commoner with the house of commons; yet his name will not go down to posterity, save in the annals of his time. Burke called him "the delight and ornament of the house of commons." Macaulay speaks of him as "the most brilliant and versatile of mankind," who had "belonged to every party, and cared for none."

TOWNSHIP, in the older of the United States is a subdivision of a county, made without reference to population (as T. may be entirely uninhabited), and varying in size from five to ten m. square. In the territories and in the states that have been formed out of them, a T. is a division of land made on the more systematic plan introduced, 1802, by Col. Mansfield, then surveyor of the n.w. territory, as follows: the entire public domain is first divided into parts entitled land districts, which are further subdivided into squares, each 6 m. sq., and these again into 36 equal squares, called sections, of 640 acres each. The political status of a T. varies considerably with the locality. In the New England states it is the original political entity, possessing large faculties of self-government, and the county is simply an aggregation of townships, mainly for judicial convenience. See TOWN. In the Middle and Western states the T. has less powers of self-government, and is more subordinated to the county, and in most of the Southern states it is simply a geographical division of the county, with few or no separate powers.

TOWNSVILLE, a town and sea-port on the east coast of Queensland, Australia, situated on Cleveland bay at the mouth of Ross creek. It is the see of an Anglican bishop, has a cathedral, court house, technical school, meat-packing establishment, and manufactories for ice, soap, etc. It is the terminus for the railway to Hughenden, 236 m. inland, and has an extensive shipping-trade, although the harbor, recently improved by two large breakwaters, is still poor, large vessels having to lie three miles from shore. Pop. '91, 8563.

TOWSON, NATHAN, 1784-1854; b. Md.; capt. in the U. S. army in the beginning of the war of 1812. With the co-operation of the naval forces, he captured the British brig *Caledonia*, at Fort Erie; he was engaged at Queenstown, Fort George, and Stony Creek; wounded in a skirmish on the outworks of Fort George, N. C. He participated in the capture of Fort Erie under Scott, was prominent in the battle of Chippewa, and remained at the front to the end of the hard fought battle of Niagara. He rose by brevet through successive grades to be maj.-gen. for services in the Mexican war.

TOXICOLOGY is the term commonly employed in medical jurisprudence to designate the science of poisons. It embraces the physical and chemical history of all known poisonous substances, the methods of testing for them, their action on the living body, the *post-mortem* results which they occasion, and (according to some writers) the medical treatment that should be adopted. The word has a somewhat far-fetched origin. The Greek word *toxicon* signifies "anything relating to *toxon*, a bow;" hence, with the word *pharmakon*, a drug, it was used to designate "poison for smearing arrows," and finally, *poison* generally. See POISONS.

TOXINE. See DIPHTHERIA.

TOXODONTIA, an order of extinct mammals from the tertiary deposits of South America, the true position of which is still doubtful, as their fossils indicate affinities to the *ungulates*, the *edentates*, and the *rodents*.

TOY, CRAWFORD HOWELL, D.D., LL.D., b. Norfolk, Va., 1836. He graduated at the univ. of Virginia, 1856; was ordained a Bapt. minister, 1860; served in the confederate armies, 1861-64, and held professorships in Furman univ. and the Southern Bapt. theol. sem. In 1880 he became prof. of Semitic languages in Harvard univ. He has published *Old Testament Quotations in the New Testament*; *History of the Religion of Israel*; and *Judaism and Christianity* (1891). He is an independent though reverential critic in his study of the Hebrew Scriptures.

TOYNBEE, ARNOLD, 1852-83; social reformer; b. in London and graduated at Oxford. With the aim of improving the condition of the working classes, he went to live in Whitechapel, and by the organization of clubs and associations among the poor, tried to produce in them the spirit of self-help, and provide them with worthy aims and rational amusements. His work in this direction stimulated the movement known as University Extension (q. v.), and after his death, which occurred in consequence of the injury to his health from his incessant toil, the friends and followers whom his example inspired, founded the well-known Toynbee Hall in 1884. Among the purposes of this institution are the improvement of the masses by opening the way to educational work, and by supplying them with the means of intelligent enjoyment. See UNIVERSITY SETTLEMENTS.

TRACERY, the beautiful forms in stone with which the arches of Gothic windows are filled or traced for the support of the glass. These forms vary with every variety of Gothic architecture. Gothic windows were at first narrow, and were covered with a simple arch. Then two windows were grouped together, and an arch thrown over both. The space thus inclosed became part of the window, and was at first pierced with a circle, quatrefoil, or other opening. When three or more windows were grouped under one arch, the *shield* or space in the arch became larger, and was pierced with apertures of various forms. In the early pointed styles, these were usually circles filled with cinquefoils, trefoils, etc. During the decorated period the tracery became more varied in form, being composed of squares, triangles, and other forms, filled with foils, and having the appearance of being packed together. This kind of tracery is called "geometric." The windows of the transition from decorated to perpendicular had tracery of a more flowing character, while that of the perpendicular (q. v.) period became almost

entirely composed of vertical lines. The flamboyant (q.v.) or contemporary style in France had tracery of a very different description—being as free and graceful as the other was straight and stiff.

TRACHEA. THE, is sufficiently described in the article RESPIRATION. We have here only to notice those affections of this tube which require surgical or medical aid.

Foreign bodies occasionally pass through the larynx into the trachea. In cases of this kind, the patient who has had some foreign substance in his mouth which is supposed to have been swallowed, is seized with a convulsive cough, threatening suffocation, but subsiding after a time. The symptoms that then ensue vary with the weight and figure of the substance, and according as it is fixed or movable. A large and very irregular body may be impacted in the trachea, and may thus more or less obstruct the respiration on both sides of the chest; and this obstruction will probably soon be increased by the inflammatory products that are excited. A small heavy body will usually pass through the trachea into one of the bronchi (usually the right), or into one of its branches, obstructing respiration to a less extent.

“If the foreign body be allowed to remain, the progress of the symptoms presents much variety in different cases. Death may occur from spasm of the glottis, or, the foreign body being propelled upward into the rima, death may take place by its mechanically preventing the passage of air, or rupture of one of the cerebral blood-vessels may be produced during one of the fits of coughing. At a later period the lungs may become congested and emphysematous, or bronchitis, pneumonia, or pleurisy may supervene.”—Gray’s article on “Injuries of the Neck,” in Holmes’s *System of Surgery*, vol. ii. p. 306. Although inversion of the body, together with succussion and lateral movement of the larynx, has in some few cases been successful, it is now deemed advisable by the highest authorities to precede the attempt at removal by making an artificial opening into the windpipe. A free aperture is thus secured for respiration, spasm of the glottis is prevented, and the foreign body is commonly expelled through the artificial opening, or falls through the glottis into the mouth.

Rupture of the Trachea from external injury occasionally happens, and generally proves fatal in consequence of the rapid and extensive emphysema which usually ensues. It is too rare an accident to require a more special notice.

Wounds of the Trachea are sufficiently described in the article THROAT. With the exception of croup (q.v.), there is no special disease of the trachea; and indeed in croup the trachea is seldom exclusively affected. Hence the term *tracheitis*, used by some nosologists as synonymous with croup, is hardly warrantable. Similarly, in more advanced life, the trachea is doubtless often the seat of inflammation, but never the special and exclusive seat, and both the symptoms and treatment merge into those of bronchitis or laryngitis.

TRACHEOTOMY AND LARYNGOTOMY. The air-passages may be opened in three different situations—namely, through the crico-thyroid membrane (see LARYNX), when the operation is termed laryngotomy; through the cricoid cartilage and the upper rings of the trachea, the operation being known as laryngo-tracheotomy; and through the trachea, below the isthmus of the thyroid gland, constituting tracheotomy proper. Laryngotomy and tracheotomy are more commonly performed than laryngo-tracheotomy, to which no further allusion is required. Laryngotomy is more quickly and easily performed, especially in adult males, and is less dangerous; tracheotomy is a more difficult, tedious, and dangerous operation, but in some cases (as, for example, where there is any necessity for introducing the forceps) must be selected. It is unnecessary to enter into details regarding the modes of performing these operations. When the operation is completed, a large curved tube to breathe through is inserted in the aperture, and secured round the neck with a tape.

A double tube or canula possesses many advantages, as, by withdrawing the inner one, which should slightly project at its lower extremity, it may be cleared of any mucus or blood that may have accumulated in it, without disturbing the wound. The caliber of the inner tube should always be sufficiently large to admit as much air as usually passes through the chink of the healthy glottis. The after-treatment is much the same as that required for wounds in the throat (q.v.). “Opening of the air-passages may be required,” says Mr. Gray, “in any case of disease or injury which produces mechanical impediment to the passage of air from the mouth into the trachea; in cases of foreign substances in the air-passages; and in some cases of suspended animation where artificial intiation of the lungs cannot be performed by the ordinary means.”—Holmes’s *System of Surgery*, vol. ii. p. 317. In the case of a foreign body, its situation will determine the seat of the incision. Among the cases in which tracheotomy is, or may be, required, are cut throat, acute laryngitis, croup, diphtheria, chronic inflammation, and ulceration of the larynx, necrosis of the laryngeal cartilages; tumors, excrescences, or epithelial growth within the larynx; tumors (bronchocoele, abscesses, etc.) external to the larynx or upper part of the trachea, and impeding respiration by pressure, etc. It has also been recommended, but with little advantage, in hydrophobia, tetanus, and severe forms of epilepsy, with the view of relieving the suffocating spasms that occur in these diseases. Laryngotomy may advantageously be resorted to in cases of spasm of the glottis, in inflammation with cedema of the cellular tissue of the larynx, in inflamma-

tion of the tongue, in tonsillitis and pharyngitis, if the swelling is so great as to produce symptoms of suffocation, etc.

TRACHOMA (derived from the Greek *trachus*, rough) is the term employed in ophthalmic surgery to designate a granular condition of the mucous covering of the eyelids, often accompanied with haziness and vascularity of the cornea. It is one of the most serious *sequelæ* of purulent ophthalmia (q.v.).

TRACHYTE, a volcanic rock, principally composed of feldspar (q.v.), confusedly agglomerated in crystals, which are usually very small. Crystals of mica and hornblende are often also present, and more rarely crystals of augite, all imbedded in a feldspathic paste. The name is from the Greek *trachus*, rough; the rock being rough to the touch. *Trachytic porphyry* is a porphyry essentially composed of trachyte. By some geologists, trachyte has been made the name of a class of volcanic rocks, in which clinkstone, obsidian, and pumice are included.

TRACING-PAPER. See PAPER.

TRACTARIANISM, a remarkable and important movement in the English church during the second quarter of the present century, which consisted in an endeavor to revive and bring into prominence the principles of antiquity, catholicity, and authority recognized in some portions of the Anglican formularies, in contrast to the Protestant sentiments long and widely prevailing. The name is derived from a series of papers entitled *Tracts for the Times*, published at Oxford during the years 1833-41, hence called the "Oxford Tracts." The causes of this remarkable reaction it would be difficult to ascertain. The agitation of the question of Roman Catholic emancipation led, in some cases, to the study of Catholic theology, with a view to determine the real grounds of difference between the Roman and Anglican churches; and the religious and æsthetic tone of Wordsworth's poetry, still more developed in Keble's *Christian Year* (published in 1828), may have disposed some minds to sentiments to which it was akin. The lectures of Bishop Lloyd, when regius professor of divinity at Oxford about 1823, on the prayer-book and the council of Trent, are considered to have led the way to the teaching of the *Tracts*. But the immediate origin of the movement appears to have been the alarm aroused for the interests of the English church on the occasion of the suppression by the reform government of some of the Irish sees, and threatened alienation of Irish church property. It is said that about that time a meeting of clergymen took place at Hadley, in Suffolk, at which measures were concerted for opposing the alleged latitudinarian tendencies of the day, and restoring the high-church theology of the Anglican divines of the 17th century. The chief promoters of the movement were the Rev. John Keble (q.v.), author of the *Christian Year*, and formerly professor of poetry at Oxford; Rev. J. H. Newman (q.v.) and R. H. Froude, fellows of Oriel; the Rev. E. B. Pusey (q.v.), regius professor of Hebrew, and canon of Christ church; Rev. Isaac Williams, fellow of Trinity, author of the *Cathedral and other Poems*; Rev. Hugh Rose of Cambridge; and others. The *Tracts* were issued anonymously, and, together with articles in the *British Critic* by the same writers, produced a great effect, especially among the clergy. Protestant principles were openly discountenanced, and tenets closely resembling those of the church of Rome were boldly put forward. The doctrines of apostolical succession, priestly absolution, baptismal regeneration, the real presence, the authority of the church, and the value of tradition, which had long lain hid in the language of the prayer-book, were widely revived and taught, and caused much alarm in some quarters; though it must be admitted that those principles had always been held by a portion of the English clergy, and claimed to be only a fair exponent of the teaching of the church. The study of the Fathers and old divines, of church history and ancient liturgies, was greatly revived in the universities and among the clergy, and a host of publications inculcating with more or less extravagance the same views issued from the press. The movement proceeded, notwithstanding the general opposition of the authorities, till it culminated in the publication, by the Rev. J. H. Newman, of the Tract No. 90, which was designed to show that much Roman doctrine might be held consistently with subscription to the thirty-nine articles. This being held to favor a "non-natural" interpretation, was received with general condemnation, and led to the termination of the series, to the resignation by Mr. Newman of the vicarage of St. Mary's, Oxford, and subsequently to his secession, in 1845, to the church of Rome. In this step he was followed by many of his friends and associates, though the other leaders of the movement have continued in the English church. With Mr. Newman's secession the Tractarian movement terminated; but its effect remains in several visible results: 1. The first of these may be said to be the revival and strengthening of the high-church party, which still maintains to a great extent the principles advocated in the *Tracts*; and though checked by some judicial decisions, such as the Gorham (q.v.) judgment, in the endeavor to acquire exclusive power, has gained great and perhaps increasing influence in the church. 2. Side by side with the revival of Catholic doctrines there has been a great development of ritual. The tractarian movement was early marked by the introduction of various alterations in the mode of performing divine service, such as the use of the surplice instead of the gown, intoning the prayers and singing the responses, the elevation of the communion table into an altar, the substitution of low open benches for high pews—all of which, though claim-

ing to be a restoration of ancient usage, having the authority of the law, were regarded with alarm as approximating to the church of Rome (see RITUALISM). 3. Another effect of the tractarian movement was the remarkable impulse given to the building and restoration of churches, and the revival of Gothic architecture, which has been manifested in all parts of England, and given a character to the ecclesiastical buildings of the present century which will mark them for ages to come. 4. The tractarian movement has undoubtedly been the cause of the secession of many English clergy and laity, some of them men of considerable ability and distinction, to the church of Rome, which has greatly increased the strength and influence of that communion in the country, and caused great scandal to Protestants. Lastly, the movement may, however, be admitted to have produced a great increase of learning, piety, and devotedness among the clergy, and the establishment of colleges, sisterhoods, and other religious and charitable institutions. See Dean Church, *The Oxford Movement* (1891).

TRACTION ENGINES. See STEAM-CARRIAGE.

TRACTORS, METALLIC. See PERKINS, ELISHA.

TRACT SOCIETIES, organizations formed to increase the circulation chiefly of religious truth. Before the invention of printing great exertions were often made to multiply copies of religious writings. Wycliffe wrote more than 100 tracts which his disciples copied and circulated; some of them were sent as far as Bohemia, and brought John Huss to a knowledge of the truth. The invention of printing was exactly in time for the reformation. Luther employed the press with great energy, and his numerous tracts were powerful instruments in spreading the truth. In the 18th c. many associations were formed to advance the work, several of them by members of the church of England; in 1743 John Wesley sent forth many tracts and books; in 1750 different denominations united in forming a tract society; in 1790 the "cheap repository tracts" were issued in great numbers to counteract the diffusion of French infidelity; in 1799 the religious tract society was organized in London, since grown to be the largest in the world. Of its publications, in more than 100 languages, 1600 million copies have been issued. Each religious denomination in England also has a society of its own; and the opponents of religion adopt the same means for spreading their views. In the United States religious tracts and volumes early appeared in considerable numbers, and societies to circulate them were formed among the Methodists in 1789, and at the beginning of this century in Boston, New Haven, New York, Philadelphia, and Baltimore. The New York tract society, formed in 1812, became the American tract society, 1825. The New England society, formed 1814, changed its name to the American tract society, 1823, and in 1825, continuing the name, became a branch of the national society having the same name, at New York. This last, now known as the American tract society, is a union organization in which many different denominations join. For the first two years of the national society's work, only tracts were published; in the third year the first volumes appeared; in the fourth the monthly distribution was started; in the eighth the attempt began to send volumes into every family; in 1841 colportage was commenced; the next stage of progress was the establishment of periodicals, first the *American Messenger*; the *German Messenger*, 1847; the *Child's Paper*, 1852; the *Illustrated Christian Weekly*, 1871. During the civil war 172 new publications for soldiers were issued. From the organization of the society large grants of money have been annually made to aid in the distribution of books among foreign nations—amounting in 50 years to \$618,000. The society has provided more than 5,000 publications, of which 1100 are volumes. Of the home publications 1500 are in 11 foreign languages for immigrants, supplying them with almost their only Christian literature. Of the periodicals, 164 million copies have been sent forth; of the other home publications, 27 million vols. have been printed, and 2,000,000,000 pages of tracts. Of these, annual grants to the destitute are made to the amount of \$50,000. The work of colportage in 35 years circulated about 14 million vols. and made nearly 12 million family visits, chiefly in portions of the country where for the time book-stores, schools, and churches did not exist. The total amount of donations and legacies received and expended during 50 years was \$4,300,000, and the sales were nearly \$9,000,000. Besides this undenominational work, the leading denominations have their own publication boards, which are large and efficient agencies.

TRACY, BENJAMIN F., b. N. Y., 1830; was graduated at Owego Academy; studied law, and was admitted to the bar in 1851; in 1853 and 1856 elected district attorney of Tioga co.; in 1861 was elected to the assembly; at its close aided in recruiting several regiments, and became col. of the 109th N. Y. He was prominent in the battles of the Wilderness and Spottsylvania; took command of the 127th regiment of colored troops; later, had charge of the rendezvous and prison camp at Elmira. After the war he entered a law firm in Brooklyn; was from 1866-73 U. S. district attorney for the eastern district of N. Y.; in 1881 was nominated for mayor of Brooklyn, but declined; in Dec. of that year became temporarily associate judge of the court of appeals; in Sept., 1882, was nominated for supreme court judge, but was defeated; in 1886 was an unsuccessful candidate for district attorney of Kings co.; in 1889 became sec. of the navy in Pres. Harrison's cabinet. In 1897 he was nominated by the republicans for mayor of New York City, but defeated by the Tammany candidate, Van Wyck.

TRACY, JOSEPH, D.D., 1794-1874: b. Vt.; graduated, Dartmouth, 1814; pastor of churches of Thetford and West Fairlee, Vt., 1821-29; edited *Vermont Chronicle* 1829-34; *Boston Recorder* one year; New England secretary of American colonization society, 40 years. His publications are *The Three Last Things*; *The Great Awakening*; *History of the American Board*; *Refutation of Charges against the Sandwich Island Missionaries*; was associate editor with Dr. Henry B. Smith of *American Quarterly Review*; contributed to semi-centennial memorial volume of the American Board.

TRADE, BOARD OF, a department of government in England designated "the lords of the committee of her majesty's privy council appointed for the consideration of all matters relating to trade and foreign plantations." In 1660, Charles II. created two separate councils for trade and for foreign plantations, which, in 1672, were consolidated into one. The board of trade and plantations, after being abolished in 1675, reappointed in 1695, and passing through various modifications, was again abolished in 1782, when its duties were transferred to the secretary of state in so far as regarded the management of the colonies, and to a committee of privy-council as regarded the other business. In 1786 the presently existing department was established by order in council, being a permanent committee of privy-council for the consideration of all matters relating to trade and the colonies. The board, as now constituted, consists of a president, together with the lord chancellor, the archbishop of Canterbury, the first lord of the treasury, the principal secretaries of state, the chancellor of the exchequer, the speaker of the house of commons, the chancellor of the duchy of Lancaster, the paymaster of the forces, the treasurer of the navy, the master of the mint, and such officers of state in Ireland as are privy-councillors in England. Practically, none of the members of the board take part in its deliberations except the president and his staff. The clerks of the council are *ex officio* secretaries of the board, but their duties as such are performed by two assistant secretaries.

The functions of the board of trade are partly of a ministerial, partly of a judicial kind, and have of late years been greatly enlarged by a variety of statutes. The board is charged with the general superintendence of all matters relating to the mercantile marine. It requires and considers reports made to its inspectors and other officers, and orders returns of various kinds regarding trade and navigation.

TRADE-MARKS. The attaching of peculiar marks by which manufacturers seek to distinguish their own productions from those made by other persons, is an important privilege, both as concerns the producer and the consumer; because no honest manufacturer will invent and apply a trade-mark to his wares unless he is convinced that they possess some special excellence which he wishes thus to make known; and it is desirable the public should have the benefit of such direction in the choice of their purchases as is thereby afforded. Nevertheless, until 1862, the law in Great Britain was in a very unsatisfactory state upon this subject, and the marks of celebrated manufacturers were pirated with the most reckless audacity, both by British and foreign firms, in most cases to enable them to pass off upon the public articles of very inferior character. For such infringement, the only remedy was to proceed by injunction from the court of chancery—a process which was far too troublesome and costly for the class of inventors most likely to be injured. The "merchandise marks act" of 1862 has remedied this evil, and simplified the whole matter, by making it a misdemeanor to forge or counterfeit any trade-mark, or falsely to apply any such trade-mark with intent to defraud, whether applied to a cask, bottle, stopper, vessel, case, cover, wrapper, band, reel, ticket, label, or any other thing, in or with which any commodity is sold, or intended to be sold. It is henceforth an offense to sell or expose, either for sale or for any purpose of trade or manufacture, articles with forged or false trade-marks, under a penalty of a sum equal to the value of such articles, and a sum besides not exceeding £5, or less than 10s. Every addition to, or alteration and imitation of, any trade-mark made with intent to defraud—the intent being the essence of the offense in all cases—is to be deemed a forgery, and punished as such. It is further made obligatory on every person who shall sell an article having a false trade-mark to give information as to where he procured it, on a demand for such information being made to him in writing. In 1875 an act was passed to establish a register of trade-marks, and amended in 1876, to the effect that, after July 1, 1877, no steps can be taken to prevent infringement unless the trade-mark has been entered in the register established under the superintendence of the commissioners of patents.

To mark any false indication of quantity is also punishable with penalties. A conviction under the act is not to affect the civil remedy at law, nor need any indictment specify who is intended to be defrauded by the fraudulent use of spurious marks. The punishment for the misdemeanor may, at the discretion of the court, either be by fine or by imprisonment, with, or without hard labor; and in the event of fines not being paid, the offender may be imprisoned until they are. The vendor of an article with a trade-mark is to be deemed to warrant or contract with the purchaser that the mark is genuine, unless otherwise vouched for in writing. A similar obligation rests upon those who sell articles marked with specific quantities. In suits at law, or in equity against persons using forged trade-marks, the court may not only order the destruction of the articles fraudulently marked, but may by injunction prevent a repetition of the offense. The time during which proceedings may be taken is limited to three years.

Trade marks cannot, as a rule, be a proper name; but wherever any proper name is taken which does not denote the origin of the goods, but is merely historical or fanciful, it may be a good trade mark. But such fanciful name must not denote or attempt to denote the character of the article on which it is claimed as a trade mark. If such name really denote the character of the article, it is a label; and if not, it is void. A signature, or the *fac-simile* of a signature, may be a trade mark; and so may a pseudonym. The validity of a trade mark is entirely independent of its novelty; and the same mark, however frequently it may have been used, may be good as applied to a different article. See Hardington's *Trade-Marks* (1881).

TRADE PROTECTION SOCIETIES are associations composed of merchants, tradesmen, and others, which have been formed for the promotion of trade, and for protecting the individual members from losses in their business transactions with each other, and with the community at large. They began to spring up about the middle of the last century—one of the first started in this country being the "London association of guardians for the protection of trade," which was established in 1776. In 1871 the board of trade granted a license for incorporation to one under the companies acts, 1862-67. The operations of these societies used to be confined chiefly to the compilation of registers of bankruptcies, insolvencies, and private settlements with creditors. The registers were formed thus: Each member informed the secretary of his society of the name, occupation, and address of the customers who became insolvent, with the amount of dividend their estate yielded; and latterly, the circumstances connected with such insolvency, whether recklessness or extravagance on the part of the bankrupt, or innocent misfortune. These circumstances were carefully recorded, and the information thus collected having been found useful, means were taken to render the registers more complete. With this view, new sections were added to the registers, and special attention was directed to the exposure of swindlers, and persons who had been guilty of fraud or embezzlement. The information accumulated in the registers, though always accessible to such members as made inquiry at the offices of the society, was kept strictly private from all others. But the extraordinary development of commercial enterprise which took place in the early part of this century, added a new stimulus to the trade protection movement. The registers which the societies now printed and circulated among their members contained transcriptions from the following public records: viz., the records of the bankruptcy courts, registers of assignments and trust-deeds, bonds or warrants of attorney, bills of sale, judges' orders, protested bills, and decrees in absence. In addition to the diffusion of information of this description, the societies undertook to recover past-due bills and accounts for their members, to investigate the circumstances connected with bankruptcies and insolvencies, collect dividends, and perform the general agency business of their members—the whole being done under the direction of a committee appointed for this purpose. Committees were also appointed to scrutinize all measures affecting trade and commerce which might be introduced into parliament, and to promote legislation favorable to the commercial interest. The sphere of action of trade protection societies thus rapidly widened, and their utility kept pace with their growth. The older societies established offices and branches throughout the country; and new societies sprang up in the large provincial cities, which in their turn opened agencies and branches in other towns and villages; and the various societies being in communication, the machinery of the whole is available for the purposes of each.

TRADES-UNIONS, in their character of benefit and sick societies, do not fall within the range of this article. We have principally to consider them as associations of workmen against employers for the purpose of gaining, either in time or money, a larger share of the profits of their trade. A brief historical sketch of the growth of the principle of combination may fitly introduce the subject.

In one form or other combination has always existed ever since the employed and employing classes became distinguishable from each other. For a long time after the conquest the inhabitants of England were of two classes, freemen and slaves. These relations not permitting work for wages, there could be then no combination in the modern sense. About the middle of the 13th c. we find that wages had begun to be paid, so that for 600 years there have been laborers receiving a money price for their services, competing for employment, and arranging terms with employers. The power of legislation was, however, with men who believed their interests antagonistic to those of the workmen, and its complexion was always favorable to masters. When, after the great pestilence of 1349, the reduced number of laborers demanded better pay, it was enacted that carters, plowmen, and agricultural servants generally should be content with their previous rate of liveries and wages; they were to continue to be paid in kind where payment in kind had been customary; they were forbidden to hire themselves for the day, but must take service for a year or other fixed period; a rate of wages was fixed for weeders, haymakers, mowers, and reapers; and their hiring for the future was to be in public. A little later, in 1363, the diet and clothing of artificers and servants were fixed by act of parliament, and clothiers were required to make, and tradesmen to sell, cloth of a regulated quality at a regulated price. The rate at which labor should be purchased was fixed after this fashion for almost two centuries, and the practice declined solely because of the impossibility of preserving it. But even within the last 150 years a relie

of the old superstition revived, so characteristic as to be worth notice. A tariff of wages, drawn up in 1725 by the Manchester justices, declares that any workman conspiring to obtain more than the rate thereby fixed, should for the third offense stand in the pillory and lose an ear. Economical error, it will be seen, is by no means the monopoly of the poor.

One of the earliest forms assumed by combination is shown by the statutes, passed about 1400 A.D., which excluded from city labor all who had been trained to the plow up to the age of 12 years. The evasion of these acts was the subject of bitter complaints from the city inhabitants, whose practical union against agriculturists was defeated by the sending of country children into towns as apprentices before they reached that age. For generations this jealousy of corporation against corporation continued with more or less intensity.

In the more ancient forms of associated labor, such as guilds and chartered companies, combinations such as those which now prevail could not exist. There were no masters and workmen as separate and opposed classes. Producers were united as against the community, and they had no reason, so long as the guild was prosperous, for internal dissension. When, by the abuse of their power in prosperity, they incurred hostile legislation, they became disintegrated; workmen were employed who had never been apprentices; and ultimately the owners of capital and the owners of labor became distinct and often opposing camps. Instead of a guild or trade being any longer a compact monopolist body, acting for itself against the community, the tendency was thenceforward for combination of one section against the other. See GUILDS.

Trades-unions, organized for purposes such as those which contemporary unions content for, have existed for more than three centuries. So early as 1548 a statute of Edward VI. is directed, among other culprits, against certain "artificers, handicraftsmen, and laborers," who had "sworn mutual oaths" to do only certain kinds of work, to regulate how much work should be done in a day, and what hours and times they should work. The usual penalties of fines, pillory, and loss of ears were to follow a breach of its enactments. Add the regulation of wages to the objects enumerated in this statute, and we have in effect the trades-unions of the present day. Many fruitless acts were afterward passed to prevent combinations for raising wages. So long as a tacit bond existed, and unquestionably one did and does exist, among employers, reprisals on the part of workmen were certain, and the only question was, whether the right of combination should be recognized by the law, or whether the parties who had recourse to it should be driven into secrecy and illegality. But it was not till 1824 that the legislature had sufficient wisdom to repeal the numerous and vexatious acts of parliament by which it had been sought to prevent the union either of masters or workmen. By the celebrated act of that year the combination of either workmen or capitalists was legalized, so long as the unions refrained from violent interference with persons who might refuse to join them. This act was supplemented by another, passed in 1825, which in effect declared legal all combinations to settle rates of wages or hours of work, and illegal all such as aimed at other methods of controlling employers in the use of capital, or in processes of manufacture. The latest legislation (see COMBINATION) goes further still, declaring combinations legal even when acting (peaceably) in restraint of trade.

A modern trades-union is a rather complex organization. Perhaps the best definition of them is the one given by the social science "committee on trade societies," appointed at Bradford in 1859, and which published its report in 1860. The committee included Dr. Farr, Prof. Fawcett, Mr. W. E. Foster, and many other well-known names, and its investigations were very searching and valuable. Indeed, its report is even yet by far the best repertory of facts on the subject. A trade society is therein defined as "a combination of workmen to enable each to secure the conditions most favorable for labor." The capitalist's accumulations afford him an advantage which the laborer, without association, does not possess. The funds of the union are intended to supply this deficiency. As accessories, the unions collect funds for other purposes, such as benefit societies, insurance of tools, libraries, and reading-rooms; but their trade objects are those with which we are especially concerned. The following means of assisting and defending the trades associated are enumerated by the committee as now in general use—1. Publishing periodically the state of the trade in different parts of the country; 2. Keeping registers of men unemployed and of masters wanting men; 3. Assisting men from town to town in search of employment, and occasionally to emigrate; 4. Regulating the number of apprentices in the trade; 5. Maintaining men in resistance to employers; 6. Regulating number of working hours, and preparing trade rules; 7. Organizing strikes.

The advocates of the unions insist that they are the only means by which workmen can defend themselves against the aggression of employers. It is argued that the individual laborer has no chance of resisting the capitalist on equal terms; that starvation treads too closely on his heels to permit his successfully opposing a reduction of his wages, however arbitrary or unjust. It is urged that associations of employers are practically universal, and that their object is mainly to secure for themselves the largest possible share of the profits which are the product of capital and labor united. It is further said that in the event of any depression of trade, the masters invariably attempt to reduce wages; and that when trade improves, they defer as long as possible the restoration of the former rate. Thus, workmen are the first to feel commercial disaster and the last to

benefit by better times. Any attempt to remedy this state of things by individual action would, it is conceived, be abortive. The capitalist might easily do without the services of any single laborer, while to the latter the loss of employment might be ruin. Association on the part of the employed class becomes, therefore, a necessity, and their organization puts them at once much more nearly on an equality with employers when negotiating either as to rates of wages or terms of labor. That in both these matters there is a constant gravitation against the workman seems to be admitted by most who have considered the subject, and there is difficulty in suggesting any effective resistance to the downward tendency, except that of combination. Unionists point to many regulations in the interests of workmen which combination has enabled them to introduce, and while they freely admit that in numerous instances the contest between labor and capital has resulted in the apparent defeat of the former, yet they assert that, in the long run, most of the points contended for have been gained. They maintain that in very many trades, they have succeeded in preventing abuses, and that the unions have contributed, more than any other agency, to make "the workman's life regular, even, and safe." Further, it is contended that the necessity for strikes will become continually less as organization becomes more perfect and uniform; the just limits of their action will be more fully comprehended; the sufferings and losses of past strikes will act as a warning against too precipitate action in the future, either on the part of masters or men; and that, in the end, the main results of combination will be secured, without the necessity of having recourse to the arbitrament of force, either in the shape of strikes or lock-outs—the latter of which, indeed, is only a strike of the employers against the employed.

Yet it cannot be concealed that against this catalogue of uses may be set many and serious evils. Some unions dislike the exertion of special or superior ability by any of their members, deeming it an injustice to the rest that one should gain higher pay or win a loftier position. In many cases, as a matter of deliberate policy they set themselves against and discountenance any elevation of the standard of labor, and so act as an effectual bar to the industrial progress of their class. In other instances, strikes are determined upon by unions at times when the position of the market renders success impossible, resulting in severe and prolonged suffering; while in some "highly skilled and limited trades," a far higher rate of wages has been enforced for a time than the value of the labor performed would justify, in the end materially checking production, or transferring the industry itself to other countries. The same effect has been produced by the arbitrary enforcement, in some branches of manufacture, of obnoxious restrictions upon the hours and mode of working. Thus, Birmingham lost much of that portion of its hardware manufacture which is now carried on by machinery, in consequence of the resistance offered by the Birmingham artisans to the introduction of machine-labor; and the steel manufacture threatened at one time to migrate from Sheffield, on account of trades-union dictation. There is, moreover, another and serious class of objections. There can be no doubt that unions foster an unfortunate spirit of antagonism. Being constantly and consciously on the defensive, they come at last to suspect evil in every movement, and to put a sinister interpretation on every action of employers. The special interests of the trade affected are too often the only objects cared for; and narrow, selfish, and unjust regulations are enacted for its supposed benefit. One trade is isolated from another; one class of laborers fences itself off against incursions upon its peculiar territory and tries, by the limitation of the number of apprentices, the enforcement of objectionable terms of service, and other coercive methods, to remain a close monopolist corporation. It is needless to point out how injuriously such a policy affects the working-classes generally, and what a complete subordination it implies of the general well-being to the desired prosperity of a small and selfish number. In some trades, the practice of coercion has grown into systematic terrorism and crime. The Sheffield grinders and the Lancashire brickmakers began with merely refusing to work with non-unionists; but their methods of procedure have ended in frequent brutal and murderous outrage. The revelations of the special commissions of 1867 are among the saddest contributions to English history.

One of these special commissions—that of Mr. Overend and his colleagues at Sheffield—is of sufficient importance and interest to warrant rather special reference. Out of about sixty trades-unions in that town, thirteen are proved to have promoted or encouraged outrages of various degrees of criminality, from theft and intimidation up to personal violence and murder. The most ordinary method of coercion in use bears the name of "rattening," and is employed to enforce payment of contributions to the unions, and to compel obedience to their rules. If any workman fall into arrear with his payments, or infringe the rules of the trade to which he belongs, his wheel-bands, tools, or other materials of work are secretly removed, and held in pledge, until he submits to the requirements of the union. This is done most frequently under the direct orders of the union officers; but sometimes a private member "rattens" another, who is known to be in some way at issue with his society, and takes the risk of his action being adopted by the remainder. In the majority of cases, on due submission and a moderate payment, the property rattened is restored to its owner. The practice is defended on the ground that it is the readiest and most effectual means of compelling the regular payment of contributions to the union funds and of enforcing obedience to union orders.

So thoroughly is it understood that rattening is the work of a trade society, that a man whose tools are taken never thinks of applying to the police for restitution; he communicates with the secretary of the union which governs his trade. In cases of contumacy on the part of a member, it is sometimes attempted to saddle his employer with the cost of the rattening, even when he is no party to the dispute, on the ground, that he ought to compel his workmen to comply with the rules of the union. Rattening is generally successful in securing its ends; but if it fail, an anonymous letter is sent to the refractory person, threatening vengeance in the event of further resistance; and in only too many instances, the threats have been carried out to the last extremity. Thus, in 1854, a man named Elisha Parker had his house blown up by gunpowder, his horse was hamstrung, and he himself disabled by a pistol-shot, because he worked with non-union men, after being warned to leave his employment. In 1857, James Linley was shot at and wounded for changing his business of grinding scissors for that of grinding saws, and keeping a greater number of apprentices than the rules of the trade prescribed. As he still persisted, he was shot to death with an air-gun in 1859. At other times, powder has been mixed with filings or other materials near the working apparatus of obnoxious persons, who have often suffered serious injuries from its explosion. The list of outrages, fatal and other, might be largely extended; but those we have given are not unfair representatives of the whole.

The lowering of the franchise to household suffrage has lent a new significance to trades-unions. They have now become a great power in politics. There is the trades congress, which holds an annual conference in the different leading towns, and discusses questions affecting the interests of labor. They have not yet begun to publish transactions; but, no doubt, they soon will, for this congress is undoubtedly to be one of the controlling social powers of Great Britain. It appoints a committee every year, which sits in London, to look after the acts of parliament and other public movements affecting trade. Another object they contemplate is to get working-men returned as members of parliament; and this they have at last accomplished by the election to the parliament of 1874 of Mr. Alexander Macdonald for Stafford, and Mr. Thomas Burt for Morpeth.

By act of the United States Congress, 1886, the term national trade union signifies any association of working-men having two or more branches in the states or territories for the purpose of aiding its members to become more skilful and efficient workers, the elevation of their character, the regulation of their wages and their hours and conditions of labor, the protection of their individual rights in the prosecution of their trade or trades, etc., or for such other objects for which working people may lawfully combine, having in view their mutual protection or benefit. Such a union shall, on filing its articles of incorporation in the office of the recorder of the District of Columbia, have the right to sue and be sued, to grant and receive, in its corporate or technical name, property, real, personal or mixed, and to use it for the objects defined in its charter; provided that each union may hold only so much real estate as may be required for the immediate purposes of its incorporation. An incorporated national T. U. may establish branches and sub-unions in any Territory. The headquarters of an incorporated national T. U. shall be located in the District of Columbia. T. U. were introduced into the United States by English working-men, and have spread rapidly, until every trade has its "union." That of the railroad engineers is perhaps the most powerful and best organized. They have not succeeded in the United States as in England, in fomenting and sustaining differences between employers and employed; though they have organized important and costly strikes, and have materially deranged the system of labor by restricting the employment of apprentices in workshops, thus limiting the field for the education of the American mechanic. For many interesting details regarding the actual workings of trades-unions and trades-associations upon the condition of wage-earners and upon the rate of wages, the reader is referred to the following: Fawcett, *Manual of Political Economy* (1876); *Report of the Massachusetts Bureau of Labor Statistics* (1880); the *Report on Strikes in the United States*, by Mr. J. D. Weeks, which formed a part of the census literature of this year; Rogers, *Six Centuries of Work and Wages* (1884); id. *Work and Wages* (1886); Brentano, *Guilds and Trade Unions*; Gibbins, *The Industrial History of England* (1890); Webb, *History of Trades Unionism* (1894); Leroy-Beaulieu, *La Question Ouvrière au Dix-Neuvième Siècle*. See also the articles, LABOR, WAGES, STRIKES, CAPITAL, COMBINATION, LOCKOUT; AMERICAN FEDERATION OF LABOR; LABOR, KNIGHTS OF; ASSOCIATIONS, SECRET AND BENEVOLENT.

TRADE-WINDS. See WINDS.

TRADITION. See RULE OF FAITH; INFALLIBILITY.

TRADUCIANISM (Lat., *traducianismus*; from *tradux*, a "vine-layer" for propagation) one of the theories adopted for the purpose of explaining the production of the soul in the procreation of the human species. The theory known as traducianism is ascribed to Tertullian as its first author; and is elaborately explained and defended by him in his

book *On the Soul*, written after he had lapsed into the Montanist heresy. In opposition to others who had held the theory of pre-existence of souls, of which pre-existing souls one is divinely infused, or, by some natural affinity, is attracted into each fœtus so soon as it has been formed by generation in the procreation of man, Tertullian taught that souls are propagated by souls as bodies by bodies, and by the same or a simultaneous process. In another place he describes this origin of soul from soul as generation, and even of a class analogous to corporeal generation; and this more gross and material exposition of the theory of traducianism is sometimes called *generationism*; which, however, is commonly looked upon as a totally distinct theory. A third hypothesis as to the origin of the soul suggested that, in the propagation of the human species, whenever a human body is formed by generation, the soul which is to animate that body is created and by divine power infused into it. This theory is called *creationism*. The discussion of these theories in the 4th and 5th c. was much promoted by the controversies on Manichæism. See MANICHÆANS.

TRAFALGAR, CAPE, a low promontory on the s. coast of Spain, about 29 m. w.n.w. of Tarifa (q.v.), on the straits of Gibraltar. It is memorable for the great naval victory obtained off its shores by the British fleet under Nelson, over the combined fleets of France and Spain, under the French commander Villeneuve and two Spanish admirals. The British force consisted of 27 sail of the line, 4 frigates, 1 schooner, and 1 cutter; the force of the French and Spaniards united amounted to 33 sail of the line, 5 frigates, and 2 brigs. It may be remarked that the largest of the enemies' ships carried 80 guns more than the largest of the British ships. The engagement resulted in a splendid victory for the British, who captured nineteen of the enemies' ships. The victory, however, was gained at the cost of the life of the greatest of English admirals. See NELSON.

TRAGACANTH. See GUM.

TRAGEDY. See DRAMA.

TRA'GOPAN, a genus of birds of the family *phasianidae*, having the head crested, but naked on the cheeks and around the eyes; a horn-like caruncle projecting backward from behind each eye; and a loose wattle, capable of being inflated, hanging beneath the bill. The tarsi are armed with a blunt spur in the male, unarmed in the female. The species are few, and are natives of Asia. They are birds of beautiful plumage, somewhat resembling pheasants, but of more bulky form, and with rounded tails of moderate length. The first known species (*T. satyrus*) has been called the *horned pheasant*. It inhabits the higher parts of the Himalaya, Thibet, and China.

TRAILL, a co. in n.e. N. Dakota, having the Red river of the North on the e. boundary; formed 1875. Pop. '90, 10,217. Area, 864 sq. m. Co. seat, Hillsboro.

TRAILL, HENRY DUFF, English author and journalist, b. 1842; graduated at Oxford in 1864 and became a member of the bar, but gave up the law for journalism and the literary profession. He wrote *Sterne and Coleridge in the English Men of Letters*; contributed to the series of *English Worthies*, *Twelve English Statesmen*, and *English Men of Action*; wrote *Recaptured Rhymes*; *Saturday Songs*; and a large number of contributions to newspapers and magazines. In 1893 he began to edit *Social England, a Record of the Progress of the People*, and in 1897 was made editor of a new magazine, *Literature*, to be published in London and New York.

TRAIN, GEORGE FRANCIS, b. Boston, 1830; merchant in Boston and in Australia, where he established the house of Caldwell, Train & Co.; went to England in 1860, and undertook to form street-railway companies in Birkenhead and London, but his plans were obstructed by legal opposition. He returned to this country in 1862. He has traveled extensively and addressed large audiences of laboring men, trades-unions, etc., in this country and in Europe. In 1857 he published *An American Merchant in Europe, Asia, and Australia*, and *Young America Abroad*. Collections of speeches followed: *Irish Independency* appeared in 1865, *Championship of Women*, in 1868. He is noted for eccentricity.

TRAINING, applied in a sporting sense, implies the acquisition of the most vigorous and perfect health, and is used alike in reference to men, horses, and dogs. An individual is said to be trained "in condition," when he has by certain processes rendered his frame as fit as it is possible for it to be, for performing some feat of strength or endurance—such as undergoing a pugilistic encounter, a wrestling match, or a trial of speed, or any other prolonged exertion. To accomplish this end, a long course of training is often gone through, in many instances of a very severe nature. It being necessary to divest the muscles of every particle of fatty tissue which can possibly be got off without direct injury to the health, it often happens that many pounds of flesh are required to be dispersed, and the most severe and continued exertion, the body being wrapped in thick suits of flannels, denominated "sweaters," is necessary. Constant hard and sharp exercise in this fashion, combined with rigid abstinence, and a strict regard to other established laws of the art, are a *sine quâ non* in getting the body into the height of condition. For example, however thirsty the person training may be, after perhaps ten miles' rapid walking in a triple suit of sweaters, he must drink but very sparingly, for although he may have taken off pounds of flesh by profuse perspiration, one glass of ale would undo the whole effect. Great attention to diet is necessary. Indeed, much of the system may, as a modern writer has aptly expressed it, be laid down in the resolute performance of the three cardinal virtues—temperance, soberness, and chastity. Almost

the same course is pursued toward animals; and whether for hunting or racing, horses and dogs have to submit to a course of training to bring them into condition. Lately, the Turkish bath, as a means of procuring the necessary reduction of flesh without such excessive labor, has been found a most efficient ally in training. Out of condition, the muscles are flabby, confused, and coated with fat; the skin dead and lifeless; the eye dull and heavy; the lungs laboring, and the movements slow. In condition, the muscles stand out hard, clear, and defined; the tendons show like cords; the skin is clear and ruddy; the eye bright; the lungs play with unrestrained freedom; and the whole frame is endued with vigor and perfect activity. Animals, from their less artificial existence, require far less training than men to bring them into condition.

TRAJAN'S COLUMN, a celebrated column at Rome, which was reared 114 A.D., by the Roman senate and people, in honor of the emperor Trajan. It is considered not only the greatest work of its architect, Apollodorus, but one of the noblest structures of its kind ever erected. The pedestal is covered with bas-reliefs of warlike instruments, shields, and helmets; and a very remarkable series of bas-reliefs, forming a spiral round the shaft, exhibits a continuous history of the military achievements of Trajan. These are in excellent preservation, and, independently of their beauty as works of art, they are invaluable as records of ancient costume. A spiral staircase in the interior of the column leads to its summit. The height of the entire column is 132 feet. It still stands erect in all its ancient beauty amid the ruins of Trajan's forum. The summit was originally crowned by a colossal statue of the emperor, which has been incongruously replaced by one of St. Peter.

TRAJAN'S WALL, a line of fortifications stretching across the Dobrudscha from Czernavoda, where the Danube bends northward, to a point of the Black sea coast near Kustendji. It consists of a double, and in some places a triple, line of ramparts of earth, from 8½ to 11 ft. in height on the average (though occasionally it attains an altitude of 19½ ft.), bounded along its n. side by a valley, which, being generally marshy, and abounding in small lakes and pools, serves admirably the purpose of a fosse. This valley was long erroneously supposed to have been at one time the channel by which the Danube emptied itself; and a scheme for utilizing it by the construction of a canal to provide a more commodious water-communication with the Black sea, in lieu of the long and troublesome navigation by the Sulina mouth, has been frequently mooted, and is undoubtedly quite practicable; but the cost of the undertaking has hitherto been a bar to its execution. During the war of 1854 Trajan's wall became an important line of defense on the invasion of the Dobrudscha by the Russians, and the invaders were twice defeated in their attempts to pass it—at Kostelli (April 10) and Czernavoda (April 20 to 22).

TRAJANUS, MARCUS ULPUS, Roman emperor, was born at Italica (Alcala), near Seville, Sept. 18, 52 A.D. He was descended from a family which was probably of Roman origin, and was early trained to arms, becoming a prominently successful leader in the Parthian and German campaigns, during the reigns of Titus and Domitian. He was rewarded for his valuable services by promotion to the offices of pretor and consul (91 A.D.), and was ultimately adopted (97 A.D.) by Nerva (q.v.) as his colleague and successor. Trajanus became sole ruler in January of the following year, and celebrated the event of his accession by the usual largess to the soldiers, which gift his liberality prompted him to extend also to the Roman citizens and their children; and he made large provision out of the imperial treasury for the upbringing of the children of poor freemen in Rome and other Italian towns, with the view of encouraging the increase of the population. In 101 A.D., Rome, for the first time, beheld its emperor leading forth his legions in person on a career of conquest, when Trajanus set out on his first campaign against the Dacians who had exacted tribute from Rome since Domitian's time. The struggle was long and destructive; the emperor's opponents were valiant warriors, and headed by an able leader, their monarch, Decebalus; but the Romans at last gained a decisive superiority; and in a subsequent campaign (104 to 105) completely subdued their opponents, whose country thenceforth became the Roman province of Dacia, and was secured by partial colonization. This conquest, the first since the death of Augustus, was celebrated, on Trajanus's return to Rome, by a triumph, and by games on a most extensive scale, which continued for four months. Thirst for dominion again impelled Trajanus to the east in 106 A.D. Landing in Syria, he marched northward, received on his way the submission of numerous princes, possessed himself of Armenia, which he made a province of his empire, and hugely gratified the Roman senate with long lists of monarchs, never before heard of, who had bowed to their sway. The record of the events of the next seven years of Trajanus's reign is extremely defective, the few notices in Dion Cassius and others being insufficient for the construction of a consecutive narrative. In 115 A.D., he again set out from Syria, directing his march this time against the degenerate Parthian empire; took Ctesiphon almost without a struggle; and descending the Tigris, and subduing the tribes on both banks, became the first and only Roman general who navigated the Persian gulf. On his return, he found that, like the bent reed which recovers its position when relieved from pressure, the peoples of Mesopotamia, north Syria, and Arabia required to be again and more thoroughly subdued. This being done, and Parthia again conquered, Trajanus, sinking under a combination of dropsy and paralysis, which had long afflicted him, attempted to reach Italy, but was overtaken

by death at Selinus, in Cilicia, Aug., 117. Though most of Trajanus's reign was spent in the gratification of his warlike ambition, the internal administration was far from being neglected; the administration of justice was vigorous and impartial; that of finance was equally acceptable; informers (*delatores*) were severely punished, and peculating governors of provinces rigorously prosecuted. The improvement and beautifying of Rome—a favorite occupation of the emperors—was carried on: the empire was traversed in all directions by new military routes, canals and bridges were constructed, new towns built, the Via Appia was restored, the Pontine marshes partially drained, the magnificent "Forum Trajani" erected, and the harbor of Centum Cellæ (Civita Vecchia) constructed. Even if there were not abundant evidence of the sincere desire of Trajanus to increase the comfort and happiness of his subjects, the customary wish formally uttered on the occasion of an emperor's accession, that he might be "happier than Augustus, better than Trajan" (*Augusto felicior, Trajano melior*), would of itself suffice for proof. During Trajanus's reign, a persecution of the Christians, of a mild character, took place; and taking into account that Trajanus almost necessarily shared the general belief that Christianity was a perilous species of fanaticism, his conduct toward them deserves, perhaps, to be entitled to moderation.

TRAJECTORIES, PHOTOGRAPHING. M. Marey has succeeded in photographing the path of a projectile. Using a very sensitive photographic plate, he wrapped a stone with a white covering, and throwing it so that it passed in front of a black screen, he succeeded in getting a photograph of its path. Also writing his name in air, he obtained a photograph of the letters. With a revolving shutter he cut off the light from the camera 100 times a second, so that he was enabled to measure the distance passed by the missile in the one hundredth part of a second.

TRAJECTORY, in mathematics, is any plane curve which cuts at a given angle a series of plane curves of the same species and having a common origin. In mechanics and astronomy, it denotes the path described by any body projected into space, and continuously acted upon by constant or varying forces; thus, the trajectory of a body projected obliquely for a little distance above the earth, is approximately a parabola (it would be accurately so, were space void, and the center of gravity of the earth infinitely distant), and the trajectories of the planets are approximately ellipses; the term, however, was long, in astronomy, exclusively applied to the paths of comets.

TRALEE', a sea port of Ireland, chief t. of the county of Kerry, stands on the river Lee, about a m. from the point at which it enters the sea, 207 m. w.s.w. from Dublin, with which it is connected by the Great Southern and Western and Killarney railways. Pop. '91, 9318.

TRALL, RUSSELL THACHER, b. Conn., 1812; studied medicine, but about 1840 ceased to prescribe drugs. In 1843 he began the supervision of a water-cure establishment, to which he afterward added a medical school for both sexes called the New York hygieio-therapeutic college. Among his numerous works are *Diseases of the Throat and Lungs*; and *The Scientific Basis of Vegetarianism*. He d. 1877.

TRAM. See SILK.

TRAMMEL-NET, a kind of net resembling the drift-net used in the herring-fishery (q.v.), but anchored and buoyed at each end, the back-rope supported by small cork-floats, and the foot-rope kept close to the ground by weights. The length varies from 20 to 300 yards. A variety of trammel-net, chiefly used in the west of England and in Guernsey, consists of three long nets fastened together at top, bottom, and ends. The two outer nets are each five meshes deep, the meshes ten inches square; the middle net is twice as long and deep as the outer ones, but the excess at the edges is gathered in and united all round with the other nets. The outer nets stand with their meshes square and opposite one another, and a fish, in passing through the first net, meets the second or middle net—which, being slack, yields to the pressure—and is carried through the opposite large mesh of the third net into a loose bag or pocket, from which it cannot escape. This net is much used for taking red mullet, and in some parts of Cornwall is called a *tumbling-net*.

TRAMPS. See BEGGAR; MENDICANCY.

TRAMWAY. See RAILWAYS.

TRANCE, or MORBID SLEEP, differs from natural repose in duration; in profound insensibility to external impressions; in following excitement and the exaltation of certain instincts, chiefly the religious and amative, rather than fatigue or exhaustion; and in being the concomitant or symptom of diseases of the nervous system. The attitude, aspect, lowered respiration, and circulation of the entranced, resemble those of the sleeper. But there are many exceptions to this observation. A girl who remained dormant for 13 years, although she grew from a child to a woman in that time, was corpse-like in appearance, had lock-jaw, and there was all but a total suspension of the signs of life. But while an individual cannot be roused from this condition by the most powerful stimulants, an electric shock, or even, it is affirmed, by a surgical operation, thought

or dream goes on uninterruptedly, and is more continuous and coherent in character than what takes place in ordinary sleep. So connected and real do these visions appear to the ecstatic, that they are generally accepted as true events, revelations, or impressions, received during a brief visit to another world. Trance has occurred epidemically during periods of great religious fervor and superstitions; and whole classes of persons are described as having preached while asleep, in the insurrection of the Cévennes. A similar phenomenon was observed in 1865 in those affected by hysteromania at Morzine, in Savoy. The affection has been divided, according to the intensity of the symptoms, into (1) *death-trance*, where neither the heart nor lungs act; where the temperature of the body falls; where no sustenance is taken, and the inner dream-life is the only vestige of vitality. Engelbrecht, who was subject to trance, wrote a book descriptive of this inner life, during which he believed himself to be transported to supernatural, if not to heavenly regions. (2) *Trance-coma*, where the breathing and action of the heart are feeble, but perceptible; the joints flexible; but where the external senses are not awake, and where the patient cannot be roused. (3) *Trance-sleep*, where, except in the insensibility to external stimuli, and in the length of the suspension of volition, little abnormal is noticed. As these states often succeed hysteria, nervous and other diseases, the bodies of the supposed dead are for a time, in certain countries, so placed as to be watched, and in circumstances favorable to resuscitation.—Mayo, *On the Truths contained in Popular Superstitions*, p. 88; Figuier, *Histoire du Merveilleux dans les Temps Modernes*, t. ii. p. 38; Dendy, *The Philosophy of Mystery*, p. 367.

TRANI, a maritime city of southern Italy, in the province of Bari, 27 m. n.w. of the town of Bari. Pop. '81, 25,173. It is surrounded by a wall with towers and moats, and entered by three gates. Trani is an archbishop's see, and has a handsome cathedral, convents, a court of appeal, a theater, and a strong castle. The streets are wide, well built, and paved with flagstones. There is a handsome square. A considerable trade in oil, wine, almonds, corn, and cotton, which last is also manufactured here, is carried on. Trani came first into notice when it submitted to the Normans in 1053. It was then the chief town of a vast county, and was an important harbor in the time of the crusades. Under the kingdom of Italy it has again begun to prosper, and promises once more to become an emporium of the commerce of the Levant, as it was in the middle ages.

TRANQUEBAR, a corruption of *Tallangambadi*, a sea-port t. on the e. coast of British India, 155 m. s. of the city of Madras. It stands on a small bay, and is backed by a well-wooded and cultivated country: is a healthy station, much cooler than Madras, and has therefore been made a convalescent depot. The town is surrounded by walls, with bastions, and is further protected by the fort of Dansborg. The territory of Tranquebar embraces 15 sq. m., and produces rice, the cocoa-nut and other palms, the mango, and a variety of fruits. The town with suburbs contains about 6200 inhabitants. The territory passed finally to the English—the Danes having been its former possessors—in 1845.

TRANSCASPIA (Russ. Sakaspijskaja), a province in central Asia, marked out by the Russian Government from what was formerly independent Tartary, and including the Turcoman region between the Oxus and the Caspian sea, with an area of 214,237 sq. m., and an estimated population of 340,000. The administrative center is Askabad. See **TURKISTAN**.

TRANSCAUCASIA, the tract of territory belonging to Russia, and extending between the Caucasus (q.v.) on the n., and Turkey in Asia and Persia on the south. It comprises the governments Tiflis (q.v.), Erivan, Yelisavetpol, Baku, and Kutais, the provinces of Daghestan and Kars, and Zakataly, giving a total area of 91,346 sq. m., and a pop. (1891) of 5,011,555.

TRANSCENDENTAL — TRANSCENDENT (*transcendentalis, transcendens*) words employed by various schoolmen, in particular Duns Scotus, to describe the conceptions that, by their universality, rise above or transcend the ten Aristotelian categories (see **CATEGORIES**). Thus, according to Scotus, *ens*, or being, because it is predicable of substance and accident alike, of God as well as of the world, is raised above these by including or comprehending them; it has the same relation to the sum of the categories, as the *summum genus* to the various genera within a single category—relation (*summum genus*) to the classes of related things (included genera). Further, the predicates assumed by Scotus to belong to *ens*, or simple existence; viz., the one, the true, the good—*unum, verum, bonum*—are styled transcendent, because applicable to *ens* before the *descent* is made to the ten classes of real existence. In later times, since Kant, the word transcendental has been largely used as equivalent to the philosophical meaning of *à priori*. See **COMMON SENSE**, **INSTINCT**.

Between the hitherto convertible terms, transcendental and transcendent, Kant himself drew a distinction, of considerable importance in understanding his own system. By the word "transcendental" he designates the various forms, categories, or ideas assumed to be native elements of human thought; implying that, although they are not products of experience, they are manifested only in experience; such as space and time, causality, etc. The word "transcendent," Kant reserves for those among the transcendental or *à priori* elements that altogether transcend experience. They may seem to be given in experience, but they are not really given. Such are the "ideas of the pure reason," God, an immaterial soul, etc. Transcendental elements, when legitimately applied to experience, as causality and relation, are called immanent.

TRANSEPT, the projecting wings on the n. and s. sides of a church, forming the smaller arms of the cross, in the ground-plan of cruciform churches.

TRANSFERENCE, in the law of Scotland, means the step by which a pending suit is transferred from a person deceased to his representative.

TRANSFORMER. When an alternating current dynamo is used to supply an electric current, a high voltage is generally used so that a large number of watts may be carried by a comparatively small-sized wire. In this case the pressure of the current is too high to be safely distributed for lighting etc., and an apparatus called a transformer or converter is interposed at the point where the current is consumed, which changes the primary or dynamo current into a secondary current of lower pressure and greater quantity. The transformer consists of an induction coil in which the iron core is wound with two windings; the primary wire is long and thin and makes a large number of coils about the core, and the secondary wire is short and thick and makes but a few turns. The iron core is generally built up of thin sheets of soft wrought iron, all separated by alternate sheets of paper and the whole solidly bolted together. This core acts as an electro-magnet and is analogous to the iron frame of a dynamo. The alternating current which circulates through the primary coil changes its direction many times per second, and the direction of the magnetism in the core is changed with each alternation of the current. This rapid change of magnetism of the core induces a current in the secondary coil (see **MAGNETISM**) whose voltage is proportional to the number of the turns of the secondary wire. With the best designed transformers the loss of electrical energy is but small in some cases, being as little as 4 or 5 per cent. If in a transformer the primary coil has 20 times as many turns as the secondary, then a secondary current will be produced whose voltage is about $\frac{1}{20}$, and whose amperes are about 20 times as great as the primary current.

TRANSFUSION OF BLOOD has been regarded as a recognized and legitimate operation in obstetric surgery since the year 1824, when Dr. Blundell published his well-known work, entitled *Physiological and Pathological Researches*. The operation had, however, been vaguely known to the medical profession for the last four centuries; and there are obscure allusions in the Roman poets, which would seem to indicate that it was practiced as early as the Augustan age:

Ut repleam vacuas juvenili sanguine venas.
Ovid.

The earliest authentic case on record is, so far as we know, that of pope Innocent VIII., who was unsuccessfully operated on in April, 1492. "The vital powers of Innocent VIII. rapidly gave way; he had for some time fallen into a kind of somnolency, which was sometimes so profound that the whole court believed him to be dead. All means to awaken the exhausted vitality had been resorted to in vain, when a Jew doctor proposed to do so by the transfusion, by a new instrument, of the blood of a young person—an experiment which had hitherto only been made on animals. Accordingly, the blood of the decrepit old pontiff was passed into the veins of a youth, whose blood was transferred into those of the old man. The experiment was tried three times, and at the cost of the lives of three boys, probably from air getting into their veins, but without any effect to save that of the pope."—Villari's *Life of Savonarola*. Although Libavius, in 1615, accurately describes the operation, there is no evidence that he ever practiced it. Passing over various experiments by Wren and Lower (both of Oxford) in the transfusion of blood from one animal to another, we find Denys of Montpellier, in June, 1667, injecting the blood of calves into the veins of a young man who had been much weakened, and had become torpid and slightly dropsical, in consequence of repeated bleedings. The first operation restored him to perfect health. Subsequent cases of his gave rise to a most virulent controversy, which ended with the decision, "that for the future, no transfusion should be made upon the human body but by the approbation of the physicians of the Parisian faculty." In November of the same year, Lower publicly made a similar experiment, which seems to have been successful; and in the following year Riva and Manfredi repeated the experiment in Italy. But the operation, although thus fairly started, soon fell into obscurity, doubtless from a want of success, due partly to the blood of calves and sheep, instead of human blood, being used, and partly to hopeless cases of old age and decrepitude being selected for its application.

At the present day transfusion is an operation which is almost always restricted* to cases of profuse hemorrhage in connection with labor; and as Dr. Playfair, in his excellent *Handbook of Obstetric Operations* (Lond. 1865), observes: "The benefits derived from it are probably twofold: 1. The actual restitution of blood which has been lost; and 2. The supply of a sufficient quantity of blood to the heart, to stimulate it to contraction, and thus to enable the circulation to be carried on until fresh blood is formed. Its stimulant action is probably of far the most importance; and if the operation is performed before the vital energies are entirely exhausted, the effect is most marked, and indeed may be said to be almost unailing."—Pp. 212, 213. Blundell was in error in believing that the blood of animals of the same species was essential; Dr. Brown-Sequard having since shown that the blood of various animals can be used indiscriminately, pro-

* A case has lately been recorded in which it proved successful in a case of coma from the fumes of carbonic oxide and carbonic acid; and it is not improbable that it may again come into more general medical use.

vided only certain precautions are taken; and the important discovery has been made by Panum that defibrinated blood is in every respect as well suited for the operation as pure blood.

TRANSIT-INSTRUMENT, one of the most important of astronomical instruments, consists of a telescope fixed to a horizontal axis, so as to revolve in the plane of the meridian, and is employed, as its name denotes, in the observation of the meridian transits of the heavenly bodies. The axis, which is the most important part of the instrument, and thus demands the utmost care in its construction, consists of a hollow sphere or cube, to opposite sides of which are tightly fastened the bases of two cones in whose apices the pivots are screwed; the sphere or cube is pierced for the admission of the telescope, which is firmly soldered at right angles to the axis. One of the pivots is hollowed so that a stream of light can be directed from a lantern half way along the interior of the axis, and through an aperture in the side, into the telescope tube, where, being received by an annular mirror, set at 45° to the axis and telescope tube, it is directed to the eye-piece, and brilliantly illumines the field of view, while the annular form of the mirror prevents any interference with the passage of rays from the object under observation to the eye. The pivots must be very carefully turned to a perfectly cylindrical form, and fitted into the instrument, so that their axis are accurately in line. One extremity of the axis carries one and sometimes two small graduated circles, each supplied with index, clamping screws, and vernier; these circles are capable of indicating angular measures to within $1'$ or $2'$. The pivots rest on massive blocks of stone or other stable material which is little affected by change of temperature, stability being the great mechanical essential of the instrument. This condition satisfied, there are three adjustments necessary before a transit can be observed; the axis must be horizontal; the line of collimation must be at right angles to the axis of motion; and the latter must be placed so as to point accurately e. and west. On the perfection of the first two of these adjustments depends whether the telescope sweeps over a great circle of the sphere, and the third is necessary to insure that this great circle shall be the meridian of the place of observation. These adjustments can never be made quite perfect, and the usual mode is to investigate the amount of error in each, and allow for it in the apparent result. To note accurately the instant of time by the astronomical clock at which the object (e.g., a star) is seen to pass the center of the field of view, is the essential part of a transit observation. The most effective method is to register the beats of the clock by an apparatus, which, at the end of each oscillation of the pendulum, marks a dot upon a uniformly moving slip of paper. This is effected by the agency of electricity, and is one of its most valuable contributions to astronomical science. At a certain point in each oscillation of the pendulum, it becomes part of a complete galvanic circuit, the contact being immediately broken by its progression in its oscillation; and it is at these points that the galvanic agency causes the dot to be made. The instant of a transit's occurrence is similarly noted by the observer, who, by a tap on a break-circuit key, fastened to the side of the transit-instrument, causes the graver to make an extra dot; and the distance of this dot from the previous seconds one, compared with the distance between two seconds dots, gives the time accurately almost to $\frac{1}{100}$ of a second. Various ingenious modes of registering have been proposed, all founded on the above principles. It is from the times of transit of the several heavenly bodies thus accurately observed, that their right ascensions are determined.

The transit-instrument was invented by Römer about 1690, and first described in 1700, in the *Miscellanea Berolinensia*, vol. iii. One was erected in Greenwich observatory by Halley in 1721; but it was little used till 1742. The present instrument in that observatory is by Troughton, and was erected in 1816.

TRANSITION, a term employed at first by Werner to designate rocks having a mineral character intermediate between the highly crystalline or metamorphic rocks and ordinary sedimentary deposits. As these rocks, in the region where the Wernerian classification originated, had a definite relation to the inferior and superior strata, and contained a uniform series of fossil remains, the term gradually came to have a chronological meaning. It was employed to designate similar deposits wherever they occurred. But a more enlarged view of the sedimentary deposits in the different countries of Europe, exploded the idea of a transition either in mineral structure or organic contents being characteristic of any set of beds, and caused the transition series to be more accurately classified as Cambrian, Silurian, and Devonian strata.

TRANSKEI TERRITORY, a dependency of the Cape Colony, between the Great Kei river (the boundary of British Kaffraria) and the borders of Natal. It includes Fingoland, the Galeka country, and No Man's Land. The coast districts from the Umlata to the Natal frontier are still independent, though surrounded, except to seaward, by British territory. Area, 2522 sq. m.; pop. 91, 153,563.

TRANSLATION OF MINISTERS, in the law of Scotland, means the removal of a minister from one parish benefice to another.

TRANSLEITHANIA, a division of the Austro-Hungarian monarchy lying e. of the Leitha river, and including Hungary proper, Transylvania, Croatia, and Slavonia, and Flume. The name is not in common use, and the division is approximately the same as the kingdom of Hungary.

TRANSMIGRATION, or the passing from one place, state, or condition into another, means, in the theological acceptation of the term, the supposed transition of the soul after death into another substance or body than that which it occupied before. The belief in such a transition is one of the most important phases in the religions of mankind. It was common to the most uncivilized and the most civilized nations of the earth; it was the object of fantastical superstition, as well as that of philosophical speculation, and it is the property of both ancient and modern times. Its basis being the assumption that the human soul does not perish together with the body, it could belong to those nations only which had already conceived an idea of the immortality of the soul; but in proportion as such an idea is crude or developed, as it is founded merely on a vague fear of death, and a craving for material life, or on ethical grounds, and a supposed casual connection between this and a future life, the belief in transmigration assumes various forms, and influences more or less the actions of men.

The lowest forms of this belief are probably those met with among several tribes of Africa and America, which hold that the soul, immediately after death, must look out for a new owner, and, if need be, enter even the body of an animal. Several negro tribes entertain this belief; they assume that the soul will choose with predilection the body of a person of similar rank to that of its former owner, or a near relation of his; and they frequently therefore bury their dead near the houses of their relatives, in order to enable the souls of the former to occupy the newly-born children of the latter, and the princely souls to re-enter the princely family; and until the soul is thus accommodated, milk, brandy, and food are placed on the grave of the deceased, to keep it, as it were, from starving; and sometimes holes are dug in the grave to facilitate the soul's egress from it. In North America some tribes slaughter their captives to feed with their blood such souls in suspense. The negro widows of Matamba are especially afraid of the souls of their husbands, for at the death of these they immediately throw themselves into the water, to drown their husbands' souls, which otherwise, as they suppose, would cling to them. The natives of Madagascar seem to have invented a kind of artificial transmigration, for in the hut where a man is about to die, they make a hole in the roof, in order to catch the outgoing soul, and to breathe it into the body of another man on the point of death. From these and instances of a similar kind, it will be seen that nations which entertain such a belief in transmigration, assume that the souls of the deceased must continue to dwell upon earth, and that one human being may be possessed of several souls. With them, the final destination of the soul is a matter of comparative indifference; its transition from one body into another a mere matter of chance, devoid—apparently, at least—of any ethical principle, and therefore without any moral effect on the living, except, perhaps, that of a stolid indifference to death, as often manifested in the plantations of the West Indies, where negroes hang themselves, in the belief that their souls will migrate into other countries, and there enjoy a happier life.

Another, more poetical, and in some respect also, more ideal form of this belief in transmigration, is that which occurs in Germanic mythology, and is still entertained in some parts of Germany and England. According to it, the soul, before entering its divine abode, assumes certain forms, or animates certain objects, in which it lives for a short period. Thus, it is supposed to enter some flower or tree, a rose, a vine, a plantain, a pine-tree; or to animate a butterfly, a pigeon, and sometimes also—if a person dies while enchanted or sleeping—a serpent, a weasel, or a mouse. The most popular form of these supposed transmigrations, however, is that of a pigeon, a representation of which bird, therefore, often occurs on the oldest tombstones. When the robber Madej, for instance, under an apple-tree confessed his crimes, one apple after another, transformed into a white pigeon, flew into the air. They were the souls of the persons murdered by him; only one apple remained, because he had not yet confessed the murder of his father; but when he did so, the last apple also—the soul of his father—assuming the shape of a gray pigeon, flew after the rest.

Different from this kind of belief in transmigration is that which is based on ethical grounds. It proceeds from the theory, that the human souls, being of divine essence, are originally pure, but during their earthly career, lose of their purity; being destined, however, to regain their original quality, are reborn again and again, until they have become free from fault, and thus worthy of re-entering the place of their origin.

A belief of this nature was entertained by the old Mexicans, and probably also the Druids. It is met with in a more developed form with the old Egyptians; but its real importance it obtained as a tenet of the religion and philosophy of the Brahmanical Hindus and the Buddhists, whence it passed into the doctrine of several philosophers of ancient Greece, and into that of some Jewish and Christian sects.

The ethical and philosophical value which such a belief may have, is necessarily relative. It will depend on what a religion or philosophy may call right or wrong, virtue or sin; it will likewise depend on the notions which religion or philosophy may entertain on the origin of the human soul, on the cause of its first birth, and on its ultimate destination, whether this destination is the merging of the soul into the essence of its creator, or a personal immortality; and again, the mode in which such a personal immortality is conceived will also necessarily influence the mode in which transmigration is supposed to take place.

Where the ideas on these questions have remained crude, the idea of transmigration,

too, is but of little ethical or philosophical worth. The old Mexicans imagine that the gods *Ometecutli* and *Omecihuatl* create in heaven the soul of a child destined to be born, and that by its acts on earth it will either ascend to the abode of the highest felicity, or remain in an intermediate heaven, or fall to hell. The highest goal, situated in the house of the sun with the god *Huitzilopochtli*, is full of pleasure and joy, and is attained merely by the souls of fallen warriors, or those who died in captivity, and women dying in childbirth. The second or intermediate heaven, cool and pleasant, but of moderate enjoyments, falls to the lot of men who are not wicked. The wicked, however, go to the abode of darkness; and in darkness consists their punishment. But those entitled to the second heaven may, if they like, also return to earth, in order to qualify themselves for the highest heaven, if such is their aspiration.

Of the Druids, it is told by classical writers that they believed in the immortality of the soul, and in its migration after a certain period subsequent to death. Little is known of the manner in which they imagined such migrations to take place; but to judge from their religious system, there can be no doubt that they looked upon transmigration as a means of purifying the soul, and preparing it for eternal life.

According to the doctrine of the old Egyptians, the human race originated after the pure gods and spirits had left the earth; and this they did because the demons, who inhabited the earth, had revolted against them, and therefore tainted it with guilt. But, in order to enable the demons to purge themselves of their guilt, the gods created earthly bodies, which the demons were sentenced to animate, so that by expiations they might regain their state of original purity. And these earthly bodies, united to the demons, are the human race; their souls were therefore created at the same time as that of the gods; and human life—the connection of body and soul—is merely intended as a means of purifying the soul, which had rebelled against its divine nature. All the precepts regulating the course of life are laid down by the Egyptians for this end; and the judgment passed after death, in the palace of Osiris, decides whether it has been attained or not. If it has not, the soul must return to the earth again, to renew its expiations; and according to the nature and measure of the guilt which it had contracted during its previous career, it must form a new union with a human body, or with the body of an animal, or even a plant. But if the soul is declared pure by the judge of the dead, it gradually ascends through the various regions of heaven, to the highest abodes of the gods and pure spirits, presided over by Phtah and Neith.

At the time when in *India* the dogma of transmigration became an integral part of the Brahmanic religion, the Hindus believed that the human souls emanated from a supreme being, which, as it were, in a state of bewilderment or forgetfulness, allowed them to become separate existences, and to be born on earth. The soul, thus severed from the real source of its life, is bound to return to it, or to become merged again into that divine substance with which it was originally one; but as its nature becomes contaminated with sin through its earthly career, it must, so long as it remains in this world, endeavor to free itself from all guilt, and thus to become fit for its ultimate destiny. Religion teaches that this is done by the observance of religious rites, and a life in conformity with the precepts of the sacred books; philosophy, that the soul will be reunited with Brahman, if it *understands* the true nature of the divine essence whence it comes. So long, therefore, as the soul has not attained this condition of purity, it must be born again, after the dissolution of the body to which it was allied; and the degree of its impurity at one of these various deaths, determines the existence which it will assume in a subsequent life. See *INDIA*, sec. *Religion and Philosophy*; and *UPANISHAD*.

Since there can be no proof of the soul's migrations, the detail in which these are described in the religious works of the Hindus, is merely fantastical, and interesting only so far as it affords a kind of standard by which, at various epochs, and by different writers, the moral merit or demerit of human actions was measured in India. Thus, Manu (in the 12th book of his code of laws) teaches: "The slayer of a Brâhman'a—according to the degree of his guilt—is reborn as a dog, a boar, an ass, a camel, a bull, a goat, a sheep, a stag, a bird, a Chân'dâla, or a Pukkas'a. A Brâhman'a, who drinks spirituous liquor, will migrate into the bodies of a worm, an insect, a grasshopper, a fly feeding on ordure, or some mischievous animal. A twice-born who steals (the gold of a Brâhman'a), will pass a thousand times into the bodies of spiders, snakes, and chameleons, of aquatic monsters, or of murderous bloodthirsty demons. He who violates the bed of his guru, will a hundred times migrate into the forms of grasses, of shrubs, and of creeping plants, of carnivorous animals and beasts with long teeth, or of cruel brutes. Those who inflict injury (on sentient beings), become flesh-eaters; and those who eat forbidden things, worms. Thieves become devourers of each other; and those who embrace women of the lowest castes, become ghosts. . . . If a man, through covetousness, has stolen gems, pearl, or coral, or whatever belongs to the precious substances, he is reborn in the tribe of goldsmiths; if he has stolen grain, he becomes a rat; if kânsya (a composition of zinc and copper), a *hansa* bird; if water, a diver; if honey, a gadfly; if milk, a crow; if juice (of the sugar-cane or the like), a dog; if clarified butter, an ichneumon; if flesh, a vulture; if fat, a shag; if oil, a cockroach; if salt, a cricket; if curds, the crane, called valâkâ," etc. A more general doctrine of the migration of souls is based by Hindu philosophers on the assumption of the three cosmic qualities of *sattva*, i.e., purity or goodness; *rajas*, i.e., troubledness or passion; and *tamas*, i.e.,

darkness or sin, with which the human soul may become endued. And on this doctrine, again, Manu and other writers build an elaborate theory of the various births to which the soul may become subject. Manu, for instance, teaches that "souls endued with the quality of *sattva* attain the condition of deities; those having the quality of *rajas*, the condition of men; and those having the quality of *tamas*, the condition of beasts." Each of these conditions, he continues, is, according to the acts or knowledge of the soul, threefold; the lowest, the middle, and the highest. "The lowest embodiment of the quality *tamas* is inanimate objects, worms, insects, fish, serpents, tortoises, tame and wild beasts; the middle state, to which the same quality leads, is (the state of) an elephant, a horse, a sūdra, a mlechchha or barbarian, a lion, a tiger, and a boar; the highest, that of a public performer, a bird, a cheat, a demon called rakshas, and a vampire-demon. The lowest condition to which the soul imbued with the quality *rajas* arrives is that of a cudgel-player, a boxer, a public dancer, a man who lives on the use of weapons, and one addicted to gambling and drinking; the middle condition, that of a king, a man of the kshatriya or military caste, a house-priest of a king, and a man fond of learned controversy; the highest, that of a gandharva or musician in Indra's heaven, a guhyaka or yaksha (two kinds of attendants on the god of riches) or another attendant on another god, or an apsaras or heavenly nymph in Indra's heaven. The lowest state procured by the quality of *sattva* is that of a vānaprastha—or a hermit of the third order of life—a religious mendicant, a Brāhman'a, or one of the demigods traveling about in palace-like cars, one of (the genii presiding over) the lunar mansions, or an offspring of Diti. The middle state, procured by the same quality, is that of a sacrificer, a rishi (q.v.), a god of the lower heaven (a deity personating one of the Vedas, 'a deity presiding over one of) the luminaries or years, one of the manes or progenitors of mankind, and of the demigods called Sādhyas. The highest condition to which the quality of *sattva* leads is that of the god Brahmā, that of a creator of the world (as Marichi, or another patriarch of the same rank), that of the genius of Dharma (virtue or right), of Mahat, or the intellectual principle of creation, and of Prakṛiti, or matter." See SĀNKHYA.

It is not necessary here to show that this detail regarding the migrations of the souls is more or less differently given by other authors at other periods of Hindu religion, according to the views which they entertained of right and wrong, of the value and rank of imaginary or created beings, and of the social conditions of men. For, since all orthodox Hindu writers agree in principle with Manu, the quotations alleged from his work suffice to illustrate the imaginary positiveness with which the doctrine of transmigration was propounded, and to establish the conclusion that this doctrine rested in India on ethical grounds.

It has been already pointed out that the belief in the soul's life after the death of the body must precede the doctrine of transmigration. As such a belief, however, may be traced in some hymns of the *R̥gveda* (see VEDA), it has been supposed that this doctrine, too, is as old as this Veda. But apart from the uncertainty which still exists regarding not only the age, but even the relative age at which the different hymns of the *R̥gveda* were composed, and setting aside the fallacy which therefore attaches to speaking of this Veda as a contemporaneous whole, it is necessary to observe that the only passage which has been adduced in proof of this important discovery does not bear it out. It is the 32d verse of the hymn i. 164, and, according to the translation of prof. Wilson (vol. ii. pp. 137, 138), runs as follows: "He who has made (this state of things) does not comprehend it; he who has beheld it, has it also verily hidden (from him); he while yet enveloped in his mother's womb, is subject to many births, and has entered upon evil." But the word of the text, *bahuprajāh*', rendered by Wilson, according to the commentator, "is subject to many births," may, according to the same commentator, also mean, "has many offsprings," or "has many children;" and as the latter sense is the more literal and usual sense of the word, whereas the former is artificial, no conclusion whatever regarding the doctrine of transmigration can safely be founded on it.

The Buddhistic belief in transmigration is derived from that of the Brahmanic Hindus; it agrees with the latter in principle, though it differs from it in the imaginary detail in which it was worked out.

Like the Brahmanic Hindus, the Buddhists believe that all souls have existed from the beginning; like them, they believe in the unreality and sinfulness of the world, in the necessity of the soul's freeing itself from the bondage of this world, and in the casual connection between the actions of man in this, and his condition in a subsequent, life. Like the Brahmanic Hindus, they hold, therefore, that sin is the cause of transmigration, and that, by a total expiation of sin, the soul ceases to be reborn, and attains its final resting-place. But since this resting-place is to the Buddhists Nirvāna (q.v.), or non-entity, whereas to Brahmanism it is Brahman, or the principle of entity; since they reject the institution of caste, which is the social foundation of Brahmanic life; since they do not acknowledge the authority of the Vedas, and the codes based on it, and therefore consider as morally wrong much that the Brahmanic Śāstras enjoin as morally right, the standard according to which the life of a Buddhist is regulated must differ in many respects from that which governs the conduct of a Brahmanic Hindu; and his ideas of reward and punishment, therefore, as reflected by his ideas of the mode of transmigration, likewise differ from those of the Brahmanic believer. To enlarge here

on this difference is not necessary, for, after the illustrations already afforded from Manu, it is easy to conceive that the *detail* of the Buddhistic doctrine of transmigration is as fanciful as that of the Brahmanic doctrine; that it is therefore partly devoid of interest, and partly intelligible only if taken in connection with the detail of Buddhistic religion and literature (see **BUDDHISM**; also **LAMAISM**). Yet it is not superfluous to point out one great difference which separates the notions of one class of Buddhists from those of the rest, as well as from those of the Brahmanic Hindus. According to the latter, and the great mass of Buddhists, it is always the same soul which ever from its first birth reappears in its subsequent births, until it is finally liberated from transmigration. But among the southern Buddhists, another idea has also taken root. In their belief, the succession of existences of a being is also a succession of souls; and each such soul, though the result of its predecessor, is not identical with it. According to this view, the body dies, and with it the soul, too, is "extinguished," leaving behind only the good and bad acts which it has performed during its life. The result of these acts now becomes the seed of a new life, and the soul of this new life is therefore the necessary product of the soul of the former life. Thus all the succeeding souls have to labor at the solution of the same problem, which began when their first ancestor entered this world, but no succeeding birth is animated by the same soul. This dogma is illustrated in their works by various similes. One lamp, they say, for instance, is kindled at another; the light of the former is not identical with that of the latter, but nevertheless without this the other light could not have originated. Or, a tree produces fruit; from the fruit another tree arises, and so on; the last tree is therefore not the same as the first, though the fruit is the necessary cause of the last.

In Greece, the doctrine of transmigration—or, as it is there called, *metempsychosis*—did not become the belief of the people, but was confined to the teaching of the mysteries and the tenets of philosophers, who probably derived it, either directly or indirectly from Egypt or India. According to some, Thales (q.v.) was the first Greek philosopher who propounded it; according to others, Pherecydes (q.v.) the teacher of Pythagoras (q.v.); but its importance in Greek philosophy it first obtained through the system of Pythagoras, who, it seems, became acquainted with it through Egyptian sources. After him, it was Plato (q.v.) who assigned to it a prominent place in his philosophy; and he probably was indebted to Hindu writers for his views on *metempsychosis*, as explained in his dialogues, especially in *Phædrus*. Plato's doctrine was refuted by Aristotle, but revived, though in a modified shape, by the Neoplatonists.

Since a belief that the consequences of the acts of man must follow their inevitable course, and can neither be averted nor stopped by the intercession of a divine power, is incompatible with a belief in divine grace, the doctrine of transmigration or *metempsychosis* could never gain a firm ground in the religion of the Jews and Christians. It deserves notice, however, that in both these religions it found adherents as well in ancient as modern times. Among the Jews the doctrine of transmigration—the *Gilgul Neshamoth*—was taught in the mystical system of the *Cabbala*, which pretends to divulge the secrets of creation and those of the nature of the divine and human soul. "All the souls," the *Sohar*, or the book of "light," the spiritual code of this system, says, "are subject to the trials of transmigration; and men do not know which are the ways of the Most High in their regard. They do not know how they are judged in all times, as well before they come to this world as after they leave it. They do not know how many transformations and mysterious trials they must undergo: how many souls and spirits come to this world without returning to the palace of the divine king." The principle, in short, of the *Cabbala* is the same as that of Brahmanism. The souls, like all other existences of this world, it teaches, must re-enter the absolute substance whence they have emerged. But to accomplish this end, they must develop all the perfections the germ of which is planted in them; and if they have not fulfilled this condition during one life, they must commence another, a third, and so forth, until they have acquired the condition which fits them for their reunion with God. On the ground of this doctrine, which was shared in by rabbis of the highest renown, it was held, for instance, that the soul of Adam migrated into David, and will come into the Messiah; that the soul of Japhet is the same as that of Simeon, and the soul of Terah migrated into Job. Generally, it was supposed by writers of this school, the souls of men are reborn in men, and those of women in women; but also the reverse takes place, as in the case of Thamar, who had the soul of a man, and in that of Judah, whose soul was in part that of a woman. And because Ruth had the soul of Thamar, she could not bear children until God imparted to her sparks of a female soul. If the soul of a man, however, is reborn in a woman, such a migration is held by some to be a punishment for the committal of great sins, as when a man refuses to give alms, or to communicate to others his wisdom. And it is by way of punishment, too, that the soul of a Jew is reborn in a heathen or in an animal—a clean or unclean beast, a bird, a fish—or even in an inanimate object. Of all these transmigrations, biblical instances are adduced—according to their mode of interpretation—in the writings of rabbi Manasse ben Israel, rabbi Naphtali, rabbi Meyer ben Gebbai, rabbi Ruben, in the *Jalkut Khadash*, and other works of a similar character. Modern *Cabbalists*—for instance, Isaac Loria—have imagined that divine grace sometimes assists a soul in its career of expiation by allowing it to occupy the same body together with another soul, when both are to supplement each other, like the blind and

the lame. Sometimes only one of these two souls requires a supplement of virtue, which it obtains from the other soul, better provided than its partner. The latter soul then becomes, as it were, the mother of the other soul, and bears it under her heart like a pregnant woman. Hence the name of gestation or impregnation is given to this strange association of two souls. That all these wild fancies have for their main object the explanation of obscure or mystical passages of the Bible, and the reconciliation of such as are or may seem contradictory, requires no remark; the philosopher, however, must look to their basis, which is purely ethical.

Among the early Christians, St. Jerome relates, the doctrine of transmigration was taught as a traditional and esoteric one, which was only communicated to a selected few; and Origenes, like the Cabbalists, considers it as the only means of explaining some biblical traditions, as that of the struggle of Jacob and Esau before their birth, or the selection of Jeremiah when he was not yet born, and many more events which would throw discredit on divine justice, unless they were justified by good or bad acts done in a former life. Of Christian sects the Manichæans (q.v.) especially adhered to this belief, but the church always rejected it as a heresy.

In concluding, at least one great philosopher of modern times may here be named as one whose views of the progress of mankind are based on the same doctrine; it is the celebrated German critic, G. E. Lessing, who endeavored to establish it on metaphysical grounds. His arguments are briefly these: The soul is a simple being, capable of infinite conceptions. But being a finite being it is not capable of such infinite conceptions at the same time; it must obtain them gradually in an infinite succession of time. If, however, it obtain them gradually, there must be an order in which and a degree to which these conceptions are acquired. This order and this measure are the senses. At present the soul has of such senses five; but neither is there any ground to assume that it has commenced with having five senses, nor that it will stop there. For, since nature never takes a leap, the soul must have gone through all the lower stages before it arrived at that which it occupies now . . . and since nature contains many substances and powers which are not accessible to those senses with which it is now endued, it must be assumed that there will be future stages at which the soul will have as many senses as correspond with the powers of nature. And "this my system," he concludes his little but important essay, *Dass mehr als fünf Sinne für den Menschen sein können*—in a fragmentary note discovered after his death—"this my system is certainly the oldest of all philosophical systems; for it is in reality no other than the system of the pre-existence of the soul and metempsychosis, which did not only occupy the speculation of Pythagoras and Plato, but also before them of Egyptians, Chaldeans, and Persians—in short, of all the sages of the east; and this circumstance alone ought to work a good prejudice in its favor, for the first and oldest opinion is in matters of speculation always the most probable, because common sense immediately hit upon it."

TRANSOM, a horizontal mullion or bar in a window, door, etc., chiefly used in late Gothic and Elizabethan architecture.

TRANSOMS, in artillery, the bars or bolts by which the two sides—technically called "checks"—of a gun-carriage are held together.—In a ship, beams across the sternpost, at right angles to that timber, fastened in the same way as the floors upon the keel.

TRANSPADANE REPUBLIC. See **CISALPINE REPUBLIC.**

TRANSPLANTING—the removal of a growing plant from one situation to another—is much practiced with many kinds of cultivated plants which are reared in a nursery and *planted out*. Many flowers and culinary plants are generally treated in this way, as well as ornamental shrubs and fruit and forest trees. It is desirable to have a ball of earth attached to the roots in every case, although this is often neglected. It is also desirable to shade the plant and water it for a few days after transplanting when possible. Young plants are easily transplanted, as their roots not having spread far are raised from the ground without much injury, and this is the thing of first importance in the operation. At a more advanced age transplanting becomes difficult, great part of the difficulty, however, being mechanical. No plant can be transplanted with safety when in flower or fruit; the plant may live, but the flowers or fruit will almost certainly perish. In like manner leaves often wither; and transplanting ought, if possible, to be performed in winter, when vegetation is least active.

The transplanting of large trees, in order to immediate effect in the neighborhood of a mansion, has been practiced for many years with success. Notwithstanding all the care that can be taken, the trees are *thrown back* for two or three years; but this in general is all the injury which they sustain, unless removed from a situation very different from that in which they are placed. It is of great importance in transplanting trees that they should be placed in their new situation in the same direction to the prevailing wind as in their former situation. This is often disregarded, and many failures are the consequence. It ought also to be borne in mind that trees taken from a thick wood and planted in a lawn, or along the sides of an avenue, cannot be expected to succeed there. They have neither roots nor branches adapted to their new situation, and suffer from unaccustomed exposure to wind and weather. Trees of quick growth, such as limes and poplars, succeed most readily when transplanted; oaks are particularly difficult. In every case, however, there is much hazard, because the roots of trees generally

spread far from the stem, and when the operation is unskillfully performed the principal roots are often cut off and the smaller ones torn by the violence, while all are injured by being laid bare. Trees thus treated seldom ever again assume a healthy appearance. The method is therefore now generally adopted of preparing the tree for transplanting by digging a trench around it at least two years beforehand, at such distance as is thought expedient, cutting the roots all round, except two or three which are left to hold the tree fast, and then filling up the trench with fresh soil of the best quality that can be procured, into which a vast number of young roots are speedily thrown out. When the tree is to be removed a new trench is made immediately on the outside of the former trench, and young roots sufficient for the nourishment of the tree are thus preserved. The ball of earth being generally too heavy for removal is reduced in size by a very careful picking away of earth, so that the rootlets shall be as little as possible injured or even laid bare. The tree is generally transported to its new situation by attaching it firmly to a pole fixed upon an axle with a pair of wheels, the ball resting upon the axle. Good soil is put into the pit dug for it, and the roots are spread out. The tree is stayed by sticks and ropes till it is well established, and heavy stones are also laid on the top of the ball, or large beams of wood are laid across it and firmly fastened to the ground at both ends. An improvement on this method has been effected by the use of a compost of vegetable mold, decayed leaves, etc., in preparing the tree for transplanting, not only in the trench dug around it, but on the top of the ball itself, so that the tree is encouraged to send out many new rootlets. A still greater improvement consists in the use of a machine by which a large ball of earth can be removed along with the tree, so that it is no longer necessary to pick away any part of the soil or to lay bare the young roots; while the tree being carried in a vertical instead of a horizontal position, all possibility of damage in this process is avoided. One of the machines used for this purpose consists of two pair of wheels about 15 ft. apart, each pair on a strong axle; the first pair smallest, and in a very large machine about $5\frac{1}{2}$ ft. in diameter; the second pair 7 feet. A strong frame rests on each axle to raise the horizontal bearers to a sufficient height. The front frame turns on a horizontal wheel, as in a carriage, for easy turning of the whole machine. Resting on the two frames are two strong horizontal beams of wood, above which are two short cross-beams with jack screws and strong chains for raising the tree. Beneath the roots and ball of earth when the tree is raised from the ground strong planks are placed, supported by chains from the beams. In order to raise the tree from its place a sloped cutting is made, and the tree is drawn gradually up the inclined plane.

TRANSPORT, MILITARY AND NAVAL. Without a powerful system of transport an army is helpless. To cross a sea a large fleet of vessels properly fitted for men and horses is requisite. When the English army of about 30,000 men crossed in 1854 from Varna to the Crimea, it took 600 vessels to carry them without any reserves of stores or food.

Not less important to the army moving by land is its transport. On entering battle infantry and cavalry usually carry three days' rations with them and 60 rounds of ammunition. The moment these are exhausted they become dependent on the transport department for their replenishment. The first reserves are immediately in rear. To bring up supplies from these, and to keep these reserves themselves supplied, is the duty of the military train as regards food, and of the field-train in respect of ammunition. Between the grand depot and the base the operation is generally intrusted to the wagons and beasts of the country, driven by natives, of course under proper military control. The amount of transport required by an army seems almost fabulous. The lowest computation must put one animal to four fighting-men. In addition to the transport of food and ammunition the wounded and sick have to be carried, both from the field to the hospitals and during a march.

In the British army the direction of the transport rests with the quartermaster-gen.; in the French army it is under the *intendant*, who is over all the administrative departments.

TRANSPORTATION, from the Latin for carrying across, means the removing of persons from one territory to another; and is thus distinguished from banishment, which is the mere driving of persons out of the country in which they live. Transportation, in this country, means a removal beyond seas, and has been in use to express the punishment of crime in that manner. The practice was known to the Romans; and transportation to Sicily will be found referred to in Cicero's charges against Verres. When the English monarchs had possession on the continent, there was much jealousy about their carrying off troublesome persons to these dominions, and thus bringing them under irresponsible power. The legal transportation of criminals from the British dominions began early in the 17th c., when they were removed to the plantations in America, and treated as slaves. This practice continued, under modifications, until it was stopped by the American revolution. Its unfitness as a punishment is obvious. The amount of infliction would depend, not on the extent of the criminal's guilt, but of his master's humanity. There were even worse evils; for young lads were kidnapped in Britain, and sold to the planters, and these victims were often unable to prove, even when they had an opportunity, that they were not legally transported for offenses. When this method

of getting rid of convicts ceased, there was great alarm that Britain would be overrun with crime, and it was hailed as a deliverance when the government resolved to establish a penal colony in Australia. The first convicts were conveyed thither in 1787. Such was the beginning of the famous colony of Sydney, or Botany Bay. Between the years 1820 and 1830, the system was at its full perfection; but though thousands were annually removed, crime did not appear to decrease. It was forgotten, that the predatory and fraudulent offenses, which are by far the greater number in this country, are trade as well as crime; and that where there is a large portion of the population, as there unfortunately is, prepared to have recourse to crime whenever it pays, the place of those removed is immediately supplied. When the criminals were sent to the antipodes, the mistake was made of supposing that they took the crime of the country with them, and that there was so much less need for precautionary measures at home. During thirty years, however, the greater proportion of the class of criminals who used to be transported, have been retained in this country, and liberated in it at the end of their punishment. This practice has been accompanied with two classes of precautionary measures—an improved police, and the reformation of juvenile delinquents. To these influences have been added free trade, and the consequence of all is, that crime is diminished to the extent of between a third and half of what it was 20 years ago. In 1838, a committee of the house of commons issued a celebrated report on the effect of transportation. It was shown to be still an extremely unequal punishment—in some instances giving rogues an opportunity of making their fortune, in other cases subjecting men less depraved, but more infirm in temper, to punishments of the most frightful kind. It was found to be accompanied by the prevalence of crimes which cannot be mentioned, and with a vast amount of general demoralization in the convict settlements. Yet it was found not to have much terror for the criminal classes, who heard more about the success than the hardships of transportees. In 1840, transportation to New South Wales came to an end; and by a succession of statutes, sentences to penal servitude were substituted for sentences to transportation. In 1868 transportation to western Australia also wholly ceased, to the great benefit of the whole continent. The practice of transportation cannot, it will be easily understood, be carried out by governments which have no colonies, though Russia manages it by possession of the desolate region of Siberia. It is a curious circumstance that the practice began in France just as this country was abandoning it.—See CONVICT; PENAL SERVITUDE; PRISONS; TICKET OF LEAVE.

TRANSPOSE, in music, is to change a piece of music in performance from the key in which it is written to another key. To play at sight an accompaniment for such an instrument as the pianoforte or organ, transposed from one key to another, requires considerable artistic skill. To the singer, transposal presents no difficulties.

TRANSUBSTANTIATION (Lat. *transubstantiatio*, change of substance, from *trans*, over, and *substantia*, a substance), a word used by the scholastic writers of the Roman Catholic church to designate the change which Roman Catholics believe to take place in the Eucharistic elements of bread and wine, in virtue of the consecration. Under the head **REAL PRESENCE** (q.v.), which is often loosely comprehended under the larger name of transubstantiation, the doctrine of Catholics as to the presence of the body and blood of Christ in the Eucharist after consecration, has been fully explained. There remains, however, beyond this doctrine as to the presence of Christ, a further inquiry concerning the elements of bread and wine which had existed in their natural condition before the consecration. For sacramentarians (q.v.), this question is easily resolved. But those Protestants who hold in common with Catholics the reality of Christ's presence, differ from them as to the copresence of the substance of bread and wine after consecration. Some Anglican divines, who hold the real presence of the body and blood, would appear to content themselves with remaining silent as to the mode of the presence. Dr. Pusey goes so far as to say that the dispute between Anglicans and Romanists is "probably a dispute about words" (*Eirenicon*, p. 229). The Lutheran views as to the mode of the presence have been explained under the heads **IMANATION**, **REAL PRESENCE** (q.v.). According to the Catholic doctrine, which has been explicitly defined as an article of faith (Council of Trent, Sess. xiii. Can. 2), "the whole substance of the bread is changed into the body of Christ, and the whole substance of the wine into His blood, the species alone remaining." What is the precise philosophical meaning of the word "species," called also "accidents," in this definition, is not declared; but in popular language it may be described as simply meaning the appearances, that is to say, those qualities or conditions of bread and wine which produce upon the senses the effects of the presence of bread and wine. It is not taught, however, that in the change called transubstantiation, the body and blood of Christ are formed out of the substance of the bread and wine, but that, in virtue of the Eucharistic consecration, the substance of bread and wine cease to exist, and that the body and blood of Christ take their place; nor that the body and blood of Christ become what the schoolmen call the "subject" of the "accidents" of the bread and wine, but merely that, by a miraculous suspension of the ordinary law, the senses still continue to receive from the Eucharistic elements all the same impressions which they had previously received from the bread and wine: viz., of color, taste, smell, solidity, extension, figure, etc.

The history of the controversy regarding transubstantiation is sketched in the article **LORD'S-SUPPER**. The objections to the doctrine have been chiefly drawn from the phil-

osophical difficulties which are involved in it; and the defenders of it have, for the most part, contented themselves with resting on the proofs which they profess to draw from Scripture and tradition, and a general demonstration that the doctrine, although mysterious, does not involve any philosophical repugnance or impossibility, and that the philosophical arguments against it are at least not conclusive. Some Catholic philosophers have even undertaken to demonstrate the possibility of transubstantiation by philosophical arguments; and it is especially remarkable that the celebrated Leibnitz (q.v.) has not only entered at great length, and in several portions of his works, into this philosophical discussion, but professes to prove, by strict philosophical principles—by the consideration of the properties of matter, of substance, of space, extension, and the like—that the essential principle of the body “may exist in many places at the same time, nay, under far-distant and distinct species.”

TRANSVAAL (i. e., across the Vaal'), or **SOUTH AFRICAN REPUBLIC**, bounded on the south by the Vaal River, on the north by the Lampopo river, on the east by Portuguese East Africa, and on the west by British Bechuanaland; is an independent Boer state with an area of 119,139 sq. m., and an estimated white population (1896) of 180,000. Estimates place the black population at 600,000.

The country is a high plateau, steppe-like in the west and northwest. There are good agricultural and pasture lands. It is estimated that 50,000 acres are under cultivation, and a certain amount of agricultural produce has to be imported, the production not being equal to the demand. Gold mining is largely carried on. In 1895 the total gold output amounted to 2,494,487 ounces, having a value of £8,569,555. Gold, wool, cattle, grain skins, liquors, ostrich feathers, ivory, and minerals, are exported. There were in 1895 424 miles of railways open, and 384 under construction. In the same year there were 1952 miles of telegraph line. The legislature consists of a parliament of two chambers of 24 members each, elected by the districts. The president is elected for five years, and is assisted by a council of five official and two non-official members. The revenue in 1895 amounted to £3,539,953, the expenditure to £2,679,095. The public debt was, in Sept., 1896, £2,690,579.

The English government, during the Zulu war, annexed the territory to the British empire under the Cape Colonial government, 1877. The people protested, sent a commission to England to ask for justice, which was not allowed to present its case. They then took up arms to maintain their independence; 5,000 Boers took possession of Heidelberg in Transvaal, and re-established the republic, with Paul Krueger, president. Feb. 27, 1881, the Boers attacked the British forces on Majuba mountain, and, after eight hours' severe fighting, drove them from their point. The Boers finally acknowledged the suzerainty of Great Britain, but were granted complete self-government. By a convention signed in 1884, however, the British government controls the foreign relations and is represented in Transvaal by a high commissioner. A peculiarity of the constitution, which has been often amended, is the division of the inhabitants of the republic into first-class burghers, comprising all the white citizens who were residents of the republic before May 29th, 1876, or who participated in the war of independence in 1881 or in the Malaboch war of 1894; and the second-class burghers, comprising the alien population who have taken out naturalization papers. Naturalization is granted only after a residence of two years, and the payment of £2, and a naturalized burgher cannot become a first-class burgher except by special resolution of the first chamber, twelve years after naturalization. These provisions have been the cause of great discontent among the alien element, known as Uitlanders, and efforts have been constantly made by them to secure equal political rights with the native Boers. Finally the Uitlander element planned a general uprising toward the end of the year 1895, but the date for the attempt was postponed to Jan. 6, 1896. In the meanwhile occurred the premature and ill-advised raid of the police of the British South Africa Company, under the leadership of Dr. L. S. Jameson (q.v.). The revolutionists were unprepared and unable to send aid to the invading force, which, being surrounded by the Boers, was obliged to surrender. The British high commissioner disclaimed all responsibility on the part of his government for the raid, and urged the Uitlanders to lay down their arms in order to save the lives of the leaders of the expedition. The Uitlanders acted on this advice, and President Krueger treated the captives with clemency. Thus the whole movement collapsed without any real trial of strength between the opposing parties. As to the points at issue between the government and the party of reform, something can be said on both sides. To the Uitlanders it has seemed a gross injustice that the government should be in the hands of what they regarded as a small and ignorant minority. They had resorted to peaceful agitation without avail and they held that the time had come for the exercise of force to redress a grievance which was as real and serious as that which had prompted the American revolution, for the principle for which they were contending was “no taxation without representation.” On the other hand, the Boers could retort that the new-comers had entered the country with a full knowledge of the nature of the constitution, that they had come for nothing but the acquisition of wealth in the gold fields, and that it was no more than right that the character and traditions of the republic as a Boer state should be maintained against aliens. Sixty years before, the Boers had fled from Cape Colony and founded their commonwealth in the wilderness; was it to be expected, they asked, that they should turn over their government to the hands of strangers whom they had not invited? Such were the most striking aspects of the internal political situation in

the Transvaal during the years 1896 and 1897. See Villiers, *The Transvaal* (1896), and James Bryce, *Impressions of South Africa* (1897). See BOERS; CAPE OF GOOD HOPE.

TRANSYLVANIA (called by the Hungarians *Erdély-Ország*—Walach, *Arja*—"the woody and mountainous country;" by the Germans *Siebenbürgen*, "seven castles," from the seven forts built by the Saxons on their establishment in the country, and which forts became nuclei of the walled cities of Hermannstadt, Klausenburg, Kronstadt, Bistritz, Mediasch, Mühlenbach, and Schäsburg; and by the Romans *Transylvania*, from its position *beyond* the forest range which stretches southward from the Carpathians, and forms its western boundary) is the s.e. part of the kingdom of Hungary, and is bounded on the n. by Hungary and Galicia, e. by Bukovina and Moldavia, s. by Wallachia, and w. by the Military Frontier, the Banat, and Hungary. It contains 21,518 Eng. sq. m., with a pop. '90 of 2,247,049, of whom 1,455,000 were Wallachs and eastern Romaines, 651,000 Magyars and Szeklers, 224,000 Germans, the rest being Slaves, gipsies, Armenians, Jews, Italians, etc. Classed according to their religious professions, 739,000 were Greeks Orientals, 606,000 Greek-Catholics and Armenians, 314,000 Calvinists, 269,000 Roman Catholics, and 224 Lutherans. Transylvania is an elevated plateau (its lowest parts being 530 feet above sea level) of an irregular form, somewhat resembling a triangle of which the upper part has been irregularly removed, and is bounded partially on the n., and wholly on the e. and s., by a high range of mountains—a continuation of the Carpathians—which sends out innumerable lateral ridges toward the center of the country, and along the western frontier, so that Transylvania is an almost perfect natural fortress. The soil is extremely fertile. The culture of fruits is extensively practiced, and immense quantities of apricots, peaches, plums, apples, pears, and walnuts are annually produced. The extensive forests, which cover nearly 5,139,000 acres of ground, contribute largely to the wealth of the country. The vine is extensively cultivated, and, in spite of the defective mode of preparation, the produce is excellent in quality. The mineral wealth of Transylvania is great, but has not been adequately developed. Among the minerals found are gold, silver, copper, iron, lead, mercury, manganese, antimony, arsenic, vitriol, etc.

Of the various races which now inhabit Transylvania the Walachs, the earliest possessors, though by far most numerous, were till recently subordinated to the other races of Transylvania, but since the revolution of 1848-49 have acquired a position in the country which, by all means, honest or dishonest, they are striving to improve; the Magyars entered as conquerors in the 10th c., and still constitute the nobility and gentry of the land; the Saxons were introduced in 1143 and 1247 from the Rhenish provinces of Lower Saxony by king Geysa II. and Bela IV. of Hungary, and received special privileges and immunities to induce them to settle in the country and improve the cultivation of the soil; and the Szeklers, or Szekhelyi, are believed to be the descendants of the once formidable Huns. The last three are the dominant races of Transylvania, and live apart from each other—the Magyars occupying the w. and center, the Saxons the s. and n.e., and the Szeklers the southeast. The Magyars, Bulgarians, and Armenians speak the Magyar language as used in Hungary; the Saxons employ Low-German in speaking, and High-German in writing, but with a considerable mixture of Magyar in both; the Szeklers speak a Turanian dialect; and the Walachs use their own language intermixed with corrupt Latin. Transylvania was conquered by the Hungarians about 1000, and was governed by voivodes till 1526, when the death of the Hungarian monarch at Mohacs prepared the way for the union of the two countries under the voivode John Zapolya; but the war which thence arose with the Austrians caused their complete severance, and Zapolya's sway was, in 1535, confined to Transylvania, of which he became sovereign lord, under the protection of the Turks. During the rest of the 16th c., the country was distracted by the bitter strife between the Catholic party, who were supported by Austria, and the Protestant party, who were allied with the Turks; the latter party, headed successively by princes of the houses of Zapolya and Bathory, generally maintaining the superiority. The next chief of the Protestant party was the celebrated Botskay, whose successes against Austria extorted from the emperor an acknowledgment of the independence of Transylvania in 1606. To him succeeded Bethlem Gabor, the determined foe of Catholicism and Austria, who did important service during the thirty years' war. Between his son and successor, Stephen, and Ragotski arose a contest for the crown, in which the latter prevailed; but on Ragotski's death, the civil war was resumed, till the complete rout of the Austrians by the Turks, under Kiupruli, placed the scepter in the hands of Michael Abaffi, who reigned, till his death in 1690, as a vassal of the Porte. The Austrians now again possessed themselves of Transylvania, despite the heroic resistance of Ragotski; and though Tekeli (q.v.) succeeded for a brief period in rolling back the invaders, the peace of Carlovitz, in 1699, again put them in possession; and after the death of Michael Abaffi II., in 1713, Transylvania was completely incorporated with Hungary. It was erected into a grand principality in 1765. During the insurrection in 1848 the Hungarians and Szeklers joined the insurgents, and forced Transylvania to reunite with Hungary, despite the opposition of the Saxons; and the Walachs, still little better than a horde of savages, were let loose over the land to burn, plunder, and murder indiscriminately; the prostration of the country being completed in the following year during the bloody conflicts which took place here between Bem and the Russian troops. In the same year Transylvania was again separated from its turbulent neighbor, and made a crownland; the portions of it which had, in 1835, been annexed to Hungary being

restored, as well as the Transylvanian military frontier in 1851. In 1867 Transylvania was again united with Hungary. It is now a province under the Hungarian crown, and is officially styled a grand-duchy. See *Transylvania, its Products and its People*, by C. Boner (Lond. 1865).

TRANSYLVANIA, a co. in s.w. North Carolina; about 335 sq.m.; pop. '90, 5881, with colored. The surface is mountainous, and most of it timber land. Co. seat Brevard.

TRAP or **TRAPPEAN ROCKS**, an important section of the igneous rocks (q.v.), associated with primary and secondary strata, so called from the Swedish *trappa*, a stair, because these rocks, having resisted, from their greater hardness, the abrading influences which have destroyed the softer sedimentary strata, stand out like huge steps on the faces of the hills and mountains in some places where they occur. Unlike granite, the trap rocks are free from silica crystallizing as a separate constituent of the rock; from the modern volcanic rocks the structural difference is very slight, consisting only of the manner in which the silicate of magnesia and lime, common to both, is crystallized—in the older rocks appearing as hornblende, while in the newer it exists as augite.

Trap rocks are composed of feldspar and hornblende, and the different varieties founded on the chemical composition of the mass depend on the relative proportion of these two minerals. When the feldspar predominates, the rock belongs to the feldspathic trap or feldstone series; and when the hornblende is abundant, it is a hornblendic trap or greenstone. This latter series contains the best-known trappean rocks. The dark hornblende preponderates, and gives to the rock a dull green color, from which it derives its well-known name of greenstone, a translation of the German *grünstein*. It has, however, been shown by Delesse that many trappean rocks owe their color to a dark variety of feldspar which exists in them, and such rocks belong rather to the feldspathic than to the hornblendic series. Some greenstones are very light green, others are so dark as to appear black, and all intermediate shades of color occur. These rocks vary also very greatly in texture: in some, the crystals are sufficiently large to be detected with the naked eye; while others are so fine-grained and compact that it is difficult to resolve the separate crystals even with the help of a lens. Experiments have shown that the size of the crystal in an igneous rock increases in proportion to the length of time during which the mass remains fluid, and so permits the continued crystalline segregation of its various ingredients. The vitreous trap and obsidian would accordingly represent a speedily cooled flow of liquid rock. In fine-grained basalt, the crystalline force has been slightly developed; while greenstones of different textures exhibit its more continued operations in proportion to the coarseness of their texture. The principal varieties of hornblendic trap are greenstone, whinstone, or trap proper. When the crystals are extremely minute, and there is a tendency in the rock to become columnar, it is a basalt. If the feldspar is a soda-feldspar, either albite or oligoclase, it is diorite. Euphotide, diallage rock, or gabbro, is a compound of Labrador feldspar and diallage, a variety of hornblende; it is a coarse, or sometimes fine-grained rock, with a granitic or porphyritic aspect. Hypersthene rock, or hyperite, is made up of Labrador feldspar and hypersthene, another variety of hornblende; it is also a granitic-looking rock, very tough, and of a grayish or greenish-black color: it is very abundant in the isle of Skye. Different varieties of hornblendic trap are based upon the structure of the rock, as well as upon its chemical composition. Trappean obsidian is not a common rock, but it is occasionally found. Porphyritic trap is more abundant; a very black variety has received the name of metaphyre. Amygdaloid is a trap with round or almond-shaped cavities, filled with agate, calcite, or other minerals, scattered through it. Trap tuff consists of fragments of scoriæ, volcanic dust, and pieces of other rocks, forming a coarse irregular mass, sometimes bound together by a calcareous cement.

The characteristic rock of the feldspathic series is feldstone, compact feldspar, or petrosilex. It is a light-colored, greenish, or bluish, very compact, homogeneous, and translucent rock, with a flinty-looking appearance. It forms a large proportion of the contemporary intruded trap rocks in the silurian measures of Wales. Clinkstone, or phonolite, is a variety found in layers or slabs which give a metallic ring when struck with the hammer. Aphanite, or cornean, scarcely differs from true feldstone, except that it is a more compact and tougher rock. Pitchstone, or retinite, is a vitreous feldstone, less glassy than obsidian, and of a green color and resinous luster: a dyke 30 ft. wide occurs on the eastern shores of the island of Arran, cutting through the sandstone rocks. When distinct crystals of one or more minerals are scattered through an earthy or compact base of feldstone, a feldspathic porphyry is formed. The ancient red porphyry of Egypt, known as *rosso antico*, belongs to this set of rocks; it consists of a red feldspathic base, in which are disseminated rose-colored crystals of oligoclase, with some plates of blackish hornblende and grains of oxidized iron ore.

As true igneous rocks come up from below, there is always a connection of some kind between the ejected mass and the inferior source of supply, except when the ejected materials have been subsequently arranged by atmospheric or aqueous agency. Pipes and dykes form such connections, and they are generally associated with tabular masses which have either spread themselves over the surface, or inserted themselves between the beds of the sedimentary strata. When the materials have been mechanically arranged,

the igneous rocks are contemporaneous with the deposits in which they occur; but in all cases where strata are cut through by dykes or pipes, or are covered by flows of liquid rock, the igneous rocks are newer than the sedimentary strata with which they are associated.

TRA'PA, a genus of plants, of the natural order *haloragiceæ* (q.v.), having a 4-parted calyx, a 4-petallous corolla, and a nut on which the altered calyx appears in the form of spines; the cotyledons very unequal in size. All the species are aquatic plants, with floating habit. *T. natans*, the **WATER CALTROP**, is the only European species. It is found in ditches and ponds in the s. of Europe, and is grown in ponds in Holland. The floating leaves are rhomboidal, toothed and smooth; those under water are cut into capillary segments. The fruit has four spines; the kernels are large and almond-like. They are good to eat, either raw or roasted, and somewhat resemble chestnuts in taste. They are often used in soups. The French name is *marron d'eau* (water chestnut). *T. bispinosa*, the **SINGHARA NUT**, affords a great part of the food of the inhabitants of Cashmere, and a tax laid upon it by Runjeet Singh yielded a large sum annually. *T. bicornis* is much cultivated in China, where the cultivation of aquatic plants is carried on to a degree unknown in other parts of the world, and its fruit is much used for food. In both these species, the nut has only two spines.

TRA'PANI (anc. *Drepanum*), one of the principal sea-ports of Sicily, on cape Trapani, in the n.w. of the island; capital of the province of that name, 40 m. w. of Palermo. Pop. '95, commune, 47,900. The town is walled, and defended by a fortress. The streets are wide, and well paved with flag-stones. There is a natural harbor, capable of admitting vessels of about 300 tons; a handsome town-house; a tower built by the Saracens; a cathedral; and many churches, some of which contain fine paintings. The inhabitants are engaged in the tunny, anchovy, and coral fisheries. The coral is brought from the coast of Barbary to Trapani to be cut and polished for exportation. Trapani is a busy town, and exports sumac, salt, soda, coral, alabaster, wine, tunny, and anchovies.

Ancient *Drepanum* was probably founded by the Carthaginians, under whom it became an important stronghold. Here took place a celebrated naval engagement between the Romans, under P. Claudius, and the Carthaginians, under Adherbal, 249 B.C., in which the former were completely beaten. In Roman history the name scarcely appears, but it seems to have flourished in obscurity both then and during the middle ages.

TRAPEZIUM (Gr. *trapezion*, a little table) is the general term for a four-sided plane figure, and is synonymous with "quadrilateral." But since all four-sided figures which have parallel sides possess distinctive appellations, the term trapezium is frequently restricted to quadrilaterals whose sides are not parallel. The trapezium in the restricted sense (exclusive of parallelograms), has some remarkable properties; thus, if its sides be bisected, and the adjacent points of bisection joined, the resulting four-sided figure is a parallelogram; the sum of the squares of its diagonals is equal to the sum of the squares of the sides, together with four times the square of the line joining the middle points of the diagonals; if it can be inscribed in a circle (i.e., if its four corners are in the circumference of any circle), the one pair of opposite angles is equal to the other pair, and the sum of the rectangles by each pair of opposite sides is equal to the rectangle by the diagonals; if it can be described about a circle (i.e., if a circle can be made to touch on the interior, each of the four sides), the one pair of opposite sides is equal to the other pair.

TRAPEZOID, a plane quadrilateral which has two of its sides parallel, and the other two not.

TRAPPIST ORDER, THE, celebrated among the religious orders of the Roman Catholic church for its extraordinary austerities, is so called from La Trappe, an abbey of the Cistercian order founded in the middle of the 12th century. The discipline of this monastery, in common with many others of the more wealthy monastic bodies, especially of those which, by one of the corruptions of the period, were held *in commendam*, had become very much relaxed; and in the 17th c. but little trace of the ancient religious observance remained. In the first half of that century the abbey of La Trappe fell, with other ecclesiastical preferments, to the celebrated Armand Jean le Bouthelier de Rancé. The circumstances which led this remarkable man to undertake a reform of his monastery, and in the end the establishment of what was equivalent to a new religious order, have been already detailed in the article Rancé (q.v.). It was in the year 1662 that he entered in earnest upon his duties, and commenced his reforms. At first he encountered decided, and even violent opposition from the brethren; but his firmness and vigor overcame it all. He himself, as an evidence of a complete change of life, entered upon a fresh novitiate in the year 1663; and in the following year made anew the solemn profession, and was reinstalled as abbot. From this time may be dated the introduction of the new austerities which have characterized the order. The monks were forbidden the use of meat, fish, wine, and eggs. All intercourse with externs was cut off, and the old monastic habit of manual labor was revived. The reform of De Rancé is founded on the principle of perpetual prayer and entire self-abnegation. By the Trappist rule, the monks are obliged to rise at two o'clock A.M. for matins in the church,

which lasts till half-past three; and, after an interval occupied in private devotion, they go at half-past five to the office of prime, which is followed by a lecture. At seven they engage in their several daily tasks, indoors or out, according to the weather. At half after nine they return to the choir, for the successive offices of terce, sext, and none; at the close of which they dine on vegetables dressed without butter or oil, and a little fruit. This meal is succeeded by manual labor for two hours, after which each monk occupies an hour in private prayer or reading in his own cell until four o'clock, when they again assemble in the choir for vespers. The supper consists of bread and water, and, after a short interval of repose, is followed by a lecture. At six o'clock they recite complin in choir, and at the end spend half an hour in meditation, retiring to rest at eight o'clock. The bed is a hard straw mattress, with a coarse coverlet; and the Trappist never lays aside his habit, even in case of sickness, unless it should prove extreme. Perpetual silence is prescribed, unless in cases of necessity. The minor practices and observances are devised so as to remind the monk at every turn of the shortness of life and the rigor of judgment; and the last scene of life is made signal in its austerity by the dying man being laid during his death-agony upon a few handfuls of straw, that he may, as it were, lay aside upon the very brink of the grave even the last fragment of earthly comfort to which the necessities of nature had till then compelled him to cling.

The reformed order of La Trappe scarcely extended beyond France in the first period of its institution. The inmates of La Trappe shared, at the revolution, the common fate of all the religious houses of France; they were compelled to quit their monastery; but a considerable number of them found a shelter at Valsainte, in the canton of Freiburg in Switzerland. In the vicissitudes of the revolutionary war, they were driven from this house; and a community numbering about 250, together with a large number of nuns, who had been established for purposes of education, found refuge at Constance, at Augsburg, at Munich, and eventually, under the czar Paul, in Lithuania and White Russia. Later in the course of the war, small communities obtained a certain footing in Italy, Spain, America, England, and, notwithstanding the prohibitory law, even in France, at Mont Genevre. After the restoration they resumed, by purchase, possession of their old home at La Trappe, which continues up to the present time to be the head monastery of the order, and numbers nearly 200 members. During the course of the last 50 years they have formed many establishments in France; a few in Germany; a very considerable one at mount Melleray, near Cappoquin, in the county of Waterford, Ireland; and others, with still more extensive territory annexed, in Kentucky, Illinois, and other states of North America. A modification of the Trappist order, called "Trappist preachers," was established about 30 years since, at Pierre-qui-Bire, near Avallon.—See Gaillardin's *Trappistes; ou l'Ordre de Cîteaux au 19 Siècle* (Paris, 1844).

TRASH. See SUGAR.

TRASIMENUS LACUS, the ancient name of an Italian lake (*lago Trasimeno*, or *lago di Perugia*) lying between the towns of Cortona and Perugia. It is about 10 m. in length by 8 in breadth; the greatest depth is not above 30 ft. The lake has no apparent outlet, and the margins are flat and overgrown with reeds. It is surrounded on all sides by hills, those on the north side, extending from Cortona to the lake, being known as the Gualandro hills—the *montes Cortonenses* of Livy—covered at the present day with oak, vine, and olive plantations. The lake contains three islands. **Trasimenus Lacus** is memorable chiefly for the great victory obtained by Hannibal in 217 B.C. during the second Punic war, over the Romans, under their consul, C. Flaminius. Hannibal, leaving Fæsulæ, passed close by the camp of Flaminius at Arretium, laying waste the country as he proceeded in the direction of Rome. This, as the Carthaginian general intended, induced the consul to break up his encampment, and follow in pursuit, Hannibal in the meantime taking up a strong position on the hills on the n. side of the lake, along which he was passing. The consul coming up early next morning, when the whole place was enveloped in mist, saw only the troops in front on the hill of *Tuoro*, with whom he was preparing to engage, when he found himself surrounded and attacked on all sides. The Carthaginians thus had the Romans completely in their power, and took such advantage of the opportunity that 16,000 Roman troops are said to have been either massacred or drowned in the lake, Flaminius himself being among the first who fell: 6,000 troops who had forced their way through the enemy, surrendered next day to Maharbal. It is said both by Livy and Pliny that the fury on both sides was so great as to render the combatants unconscious of the shock of an earthquake which occurred during the battle.

TRAS-OS-MONTES (beyond the mountains), a province of Portugal, forming the n.e. corner of the country, is bounded on the n. and e. by Spain, on the s. by the river Douro, and on the w. by the Portuguese province of Minho. Area, 4260 sq.m.; pop. '90, 418,917. It is in the main a cold plateau, with bare mountain masses, broken through by deep romantic ravines; but the port-wine district, known as the *Alto-Douro*, is very pleasant. Considerable quantities of wheat and rye are raised, but the chief products are wine and oil. In several places, the silk-worm cultivation is prosecuted with success. Fruits, especially oranges, are produced abundantly in the valleys, and sumach on the mountains, which are also rich in unutilized metallic wealth.

TRASS, a tufaceous deposit of the extinct volcanoes of the Eifel, near Coblenz, resembling the Puzzolana of Naples. Its base consists almost entirely of pumice, in which are imbedded fragments of basalt, burnt shale, slate, sandstone, etc., and even numerous trunks and branches of trees. Its formation is accounted for by supposing an eruption to have taken place, with copious evolution of gases, in a lake-basin, and a flood of the mud thus formed to have swept away whatever came before it. Large areas are covered by the trass, which has choked up valleys, now partially re-excavated.

TRAVANCORE, a protected state in the extreme s. of India, bounded on the e. by the states of Tinneveli and Madura, and on the w. by the Indian ocean. Area, 6,730 sq.m.; pop. '91, 2,557,736. At the southern extremity of the state is cape Comorin (properly Kumarin). On the elevations the soil is light and gravelly; in the valleys it is in general a deep black mold. Rice, the sago-palm, and vegetables, are the principal products. Formerly the capital was Travancore, a decayed and unimportant town; the present capital is the small town Trivandrum.

TRAVELERS, LAW AS TO. In the United Kingdom, entire freedom of traveling is one of the rights of the subject. The rights of travelers in regard to the use of roads are stated under the head of highway (q.v.). Other rights are noticed in connection with inn (q.v.). With regard to travelers by conveyances, whether by land or sea, if the party conveying is a public carrier, then the following are his liabilities: A public carrier having a stage-coach (and railway companies are on the same footing) does not engage or warrant to convey a traveler with absolute safety, as is the case with respect to goods, but merely to convey without negligence on his part; hence, if the conveyance meets with some accident, resulting in injury to the traveler, the right of the latter to recover damages depends on whether the carrier or railway company has been guilty of negligence. Considering that, in case of a dispute, it is always left to a jury to say whether there was negligence or not, it is a safe maxim, that there is scarcely anything in the form of an accident which is not resolvable by a jury into negligence on the part of the carrier or company; and an injured traveler has seldom much difficulty in throwing the burden on the carrier of proving that there was no negligence on his part; and this proof, for the reasons stated, is seldom successful, at least where the accident arose from a defect in guiding the carriage. In case of accidents not fatal, the party injured has almost always a remedy against the carrier, the chief dispute being as to the amount of damages, the amount legally demandable varying according to the position in life and injury to business caused by the accident. In case of death caused by blamable accident in traveling, there was formerly no remedy available to the executors or relatives, and there is none at the present day; but if the deceased party leave a wife, husband, parent, or child, then these, but no other relations, can sue for damages. In the case of a traveler's proceeding a great distance over several lines of railway, his remedy is entirely against the company with whom he contracted—that is to say, to whom he paid the lump sum, and from whom he obtained his ticket.

A noticeable difference between England and the U. S. in what is known as the "law of the road," is that in the U. S. vehicles and pedestrians meeting and passing on the highway go each to the right-hand side of the road, while in Eng. the rule is to take the left under similar circumstances. The law in the U. S. as to the liability of common carriers has been already noticed. It may be added that in analogy to the law of Eng. most of the state legislatures have enacted laws giving to representatives of persons whose death is caused by the negligence of carriers or others the right to recover damages to the amount of \$5,000. See PASSENGER, LUGGAGE.

TRAVELER'S TREE, or RAVENALA, *Urania speciosa*, or *Ravenala Madagascariensis*, a remarkable plant of the natural order *musaceæ*, a native of Madagascar, and forming a characteristic feature of the scenery of many parts of that island. The stem resembles that of the plantain, but sends out leaves only on two opposite sides, like a great expanded fan. The lower leaves drop off as the stem grows, and in an old tree the lowest leaves are sometimes 30 ft. from the ground. A tree often has 20 or 24 leaves, the stalk of each leaf being 6 or 8 ft. long, and the blade 4 or 6 ft. more. The blade of the leaf is oblong, bright green, and shining. The fruit is not succulent, but is filled with a fine silky fiber of the most brilliant blue or purple color, among which are about 30 or 40 seeds. Forty or fifty fruits grow in a bunch, and three or four bunches may be seen at once on the tree. The leaves are much used for thatch, and for many other purposes; and the leaf-stalks for the partitions, and often even for the walls of houses. The leaf-stalks always contain water, even in the driest weather, more than a quart being readily obtained by piercing the thick part of the base of a leaf-stalk, and this water is pure and pleasant; hence the name *traveler's tree*.

TRA'VEMÜNDE. See LÜBECK.

TRAVERSE, in fortification, mounds of earth, above the height of a man, and 18 ft. thick, placed at frequent intervals on a rampart to stop shot which may enfilade the face of such rampart. A fire of this nature, in the absence of traverses, would dismount the guns, and prove altogether ruinous. The traverses also give means of disputing the progress of an assailant who has gained a footing on the wall, for each traverse becomes a defensible parapet, only to be taken by storm.

TRAVERSE, a co. in w. Minnesota, adjoining S. Dakota; bounded w. by lake Traverse; drained by the Mustinka and Bois de Sioux rivers; 552 sq. m.; pop. '90, 4516, chiefly of American birth. The surface is prairie. Co. seat, Wheaton.

TRAVERSE CITY, city and co. seat of Grand Traverse co., Mich.; on Grand Traverse bay and the Chicago and West Michigan, the Grand Rapids and Indiana, and the Manistee and Northeastern railroads; 60 miles n.e. of Manistee. It is the seat of the Northern state hospital for the insane; has national and state banks, electric lights, ladies' library association, saw, planing, and flour mills, iron foundries, and daily and weekly newspapers; and, by its regular communication with the principal ports on lake Michigan, has large shipping interests, particularly of lumber. Pop. '90, 4353.

TRAVERSING PLATFORM, an arrangement for the more rapid and easy movement of cannon in battery. The gun is either mounted on an ordinary truck-carriage, or on rollers under its trunnions. The truck or rollers work in and out on two parallel iron rails, which rails are mounted on the traversing carriage, and are 16 ft. or more in length. Wheels at each end of this platform, or more frequently if the weight of the gun be very great, are placed at right angles to the direction of the rails, and run on circular tramways, which have their center in the embrasure through which the gun is fired. The rails incline upward toward the rear, to moderate the gun's recoil. The advantages are, that the leverage for turning the gun is increased by the platform's length, while the circular rails diminish the resistance; that the gun is easily run out for firing on the upper rails; that by its own recoil it runs itself in again for loading; and that a much smaller embrasure is required to give a good compass to the muzzle.

TRAVESTY (Fr. *travestir*, to disguise, particularly through the effect of *contrast*; e.g., to dress in another sex's or person's clothes; Ital. *travestire*) is a term applied in literature to denote a burlesque representation of something previously executed in a serious and lofty manner. It differs from parody (q.v.) in this respect: That while the latter changes the subject-matter and the *dramatis personæ*, but mockingly imitates the style of the original, the former leaves the subject-matter partially, and the *dramatis personæ* wholly, unaltered; producing a purely comic effect by the substitution of the mean, the frivolous, and the grotesque in action or speech, for the serious, the noble, or the heroic.

TRAVIS, a co. in central Texas, drained by Colorado river and Union creek; traversed by the International and Great Northern, the Houston and Texas Central, and other railroads; about 1040 sq. m.; pop. '90, 36,322. Co. seat, Austin.

TRAVNIK, a t. of Bosnia, and its capital, stands on the Lasva river, 45 m. w.n.w. of Bosna-Seral. Its numerous mosques and the castle, which dates from the middle ages, are the principal edifices. It contained (1885) 5933 inhabitants. The principal branch of industry is the manufacture of sword-blades.

TRAWLING, a mode of fishing by a net dragged along the bottom of the sea, behind a boat. It is much employed in deep-sea fishing on the coast of England, and by far the greater part of the fresh fish brought to the London market, herring and mackerel excepted, is now obtained by trawling. Trawling has long been practiced on some parts of the s. coast of England, but of late years this mode of fishing has been adopted much more extensively than before, and has been introduced where it was formerly unknown, particularly on the e. coast of England, not without great opposition on the part of line-fishers and others, who have loudly complained of injury done by it to the fisheries by destruction of spawn, and otherwise. The report of the commissioners on the sea fisheries of the United Kingdom, 1866, sets aside all complaints against it, however, as unfounded; while its great productiveness recommends it as advantageous to the public interest. The *trawl*, or *beam-trawl*, as it is often called, is a triangular purse-shaped net, about 70 ft. long, usually having a breadth of about 40 ft. at the mouth, and gradually diminishing to 4 or 5 ft. at the commencement of the *cod*, or smaller end of the net, which is about 10 ft. long, and of nearly uniform breadth. The upper part of the mouth is secured to a wooden beam about 40 ft. long, which keeps the net open; this beam is supported on two upright iron frames, known as the *trawl-heads* or *irons*. The under side of the net corresponds with the upper, except that instead of being fastened to a beam, it is made with a deeply-curved margin attached to the *ground-rope*, the whole length of it in contact with the ground. A trawl has also generally two *pockets*, one on each side, made by lacing together the upper and under parts, so that fish turning back from the cod may be caught in them. The meshes vary in size from 4 in. square at the mouth to an inch and a quarter square in the cod. Two stout ropes, of about 15 fathoms each, are fastened, one to the front of each of the trawl-heads, the other ends united to form a bridle, to which is shackled a warp 150 fathoms long. By this warp the trawl is towed, the quantity of rope paid out depending on depth of water, weather, and other conditions. Trawling is generally in the direction of the tide, sometimes across it, but never against it. The rate of progress is usually only from $\frac{1}{4}$ a m. to 2 m. an hour faster than that of the stream. The trawl can only be used with advantage on a sandy bottom or other smooth ground. On rough ground the net would be torn in pieces. The vessels employed in trawling on the Dogger bank and elsewhere near the English coast vary in size from 35 to 60 tons. Many of these trawlers, however, stay out

at sea for six weeks at a time in all seasons of the year; their fish being packed in ice collected by fast-sailing cutters, and so conveyed to market. Cod, haddock, and other *white-fish* are caught in great numbers by trawling; and some kinds of flat-fish, as soles, are scarcely to be obtained by any other means. Smaller trawl-nets than those above described are used in bays and estuaries. A kind of trawl called the *pole-trawl* was formerly in use in some parts of England, but is now used only in the s. of Ireland. It is much less effective than the beam-trawl. Instead of a beam, two poles of 25 to 30 ft. long are used, rigged out on the sides of the vessel, to keep the mouth of the net open.

The term trawling is commonly, although incorrectly, employed in Scotland to designate a particular mode of herring-fishing, which, however, is only seine-net fishing (see **NETS**) on the principle of encircling shoals of fish, as has been practiced in pilchard-fishing on the s. coast of England from time immemorial. It is of recent introduction in Scotland, and has been opposed by the drift-net herring-fishers, from interested motives, in the same way that beam-trawling has been opposed on many parts of the English coast. The legislature too hastily accepted the views of its opponents; but a royal commission having been appointed to inquire into the subject, made a report decidedly favorable to it in 1863; and the judgment of that commission was sustained by the report of the sea-fisheries commission of the United Kingdom in 1866.

TREACLE. See **SUGAR**.

TREAD-MILL, an appliance of prison discipline, much in use some years ago in the prisons of Great Britain, the invention of sir William Cubit, of Ipswich. It consists of a wheel in the form of a long cylinder, furnished with 24 steps round its circumference, and turned on its axis by the tread of prisoners, each of whom may be made to tread in a separate compartment, so boarded off that he can have no intercourse with the rest. The prisoners are assisted and supported by a hand-rail, and cause the wheel to revolve about twice in the minute. The tread-mill has sometimes been made productive by being used to grind corn or turn machinery. It has been found an objection to its use, that it does not admit of being modified to meet the varying strength of individual prisoners; and as an instrument of prison discipline, it has been generally supplanted by the *crank*, a small flaked wheel, like the paddle-wheel of a steamer, which, on the prisoner turning a handle outside, revolves within a box partially filled with gravel. The amount of strength necessary to each revolution can be regulated by the quantity of gravel used, and a register placed outside the prisoner's cell records the number of revolutions made. The crank is only used when hard-labor is part of the prisoner's sentence.

TREADWELL, DANIEL, 1791-1872; b. Mass.; invented a new form of the printing press in 1818. During a visit to England in 1819 he originated a power-press, and in 1826 he proposed the turnout system for single-track railroads. He invented in 1829 the first successful machine to spin hemp for cordage, and works for that purpose were put up in Boston in 1831. He invented what substantially is now known as the Armstrong gun at least eighteen years before sir William Armstrong, who added to the Treadwell gun rifling and breech-loading. Treadwell, with Dr. John Ware, founded in 1822 the *Boston Journal of Philosophy and the Arts*. He was Rumford professor of technology at Harvard college, 1834-45.

TREADWELL, JOHN GOODHUE, 1805-56; b. Salem, Mass.; son of Dr. John Dexter, graduated from Harvard university, 1825; studied medicine, established a practice in Salem, 1825; and devoted much time to farming by scientific methods, and making agricultural experiments. He founded a professorship of physiology and anatomy at Harvard university, bequeathing to it an estate valued from \$75,000 to \$100,000; and to the Essex county agricultural society he left his Topsfield farm for experimental purposes.

TREASON (Fr. *trahison*, Lat. *traditio*, from *tradere*, to give up or betray), in the law of the United Kingdom, is the highest civil crime which a member of the community can commit, being treachery against the sovereign. By the ancient common law of England, there was great latitude as to what was held by the judges to be treason, whereby, says Blackstone (b. iv. c. vi.), the creatures of tyrannical princes had opportunity to create abundance of constructive treasons, that is, to raise, by forced and arbitrary constructions, offenses into the crime and punishment of treason, which never were suspected to be such. Thus, the accroaching, or attempting to exercise royal power—a very uncertain charge—has been treated as treason; and killing the king's father or brother, or even his messenger, has also been so treated. The inconvenience of these constructive treasons led to the passing of the statute of 25 Ed. III. c. 2, which attempted to define treason, and it was defined in five forms: 1. When a man compasses or imagines the death of the king, queen, or their eldest son and heir. Under this clause it was held that the husband of a queen-regnant was not included; but it includes a king *de facto* without regard to his title. The phrase "compassing and imagining the death of a king," has given rise to much discussion, but it has been taken to mean the mere purpose or design, as distinguished from the carrying such design into effect; nevertheless, the purpose can only be proved by some overt act, such as providing weapons or ammunition for the purpose of killing the king, assembling and consulting on the means to kill the king, etc. The law has often, however, been strained, and in arbitrary reigns.

even a sermon unpreached was held to convict Peachum; and a paper found in a closet, to convict Algernon Sidney, though merely speculative in its character. 2. Another form of treason is the violating of the king's companion (i.e., wife), or his eldest daughter unmarried, or the wife of the king's eldest son and heir. 3. Another form is that of levying war against the king in his realm, either by taking arms to dethrone the king, or under pretense to reform religion or the laws; by resisting the king's forces; by joining an insurrection, with an avowed design to pull down all inclosures, all brothels, and the like; though such a conspiracy, if aimed at a particular house, would be only a riot. 4. It is also treason to adhere to the king's enemies in the realm by giving them aid and comfort, as by sending intelligence or provisions, or selling arms. 5. Lastly, it is treason to slay the chancellor, treasurer, or the king's justices of the bench, or in assize, while in their places administering justice. Besides these specific forms of treason, the statute of Edward III. enacted that, if there should be other cases not above specified, the judge should tarry without going to judgment, till the king and parliament should judge it treason or other felony—which was a safeguard against the judges indulging too much in refinements about constructive treason. At a later period, between the reigns of Henry IV. and queen Mary, the courts returned to the system of inventing constructive treasons, and actually included as such the clipping of money, burning houses to extort money, refusing to abjure the pope, etc. These and other new-fangled treasons were totally abolished by a statute of 1 Ed. VI. c. 12. By a subsequent statute of 1 Anne c. 17, whoever endeavors to hinder the next in the succession under the act of settlement, from succeeding to the crown, is to be held guilty of treason; and whoever maliciously affirms another to have right to the crown, otherwise than according to the act of settlement, commits treason. Moreover, by 36 Geo. III. c. 7, whoever compasses or intends death or bodily harm to the person of the king, is to be adjudged a traitor. One of the characteristics of an indictment for treason is, that a copy of the indictment, and a list of the witnesses and jurors, must be delivered to the prisoner. This information, which gives the names, and also the places of abode of all the witnesses, must be delivered to the prisoner ten days before the trial; and the prisoner is entitled to have counsel assigned to defend him. This right, which prisoners accused of other crimes have not in English law, was conferred by a statute of Will. III.

The punishment of treason was severe and even revolting. The traitor was to be drawn on a hurdle to the place of execution, hanged by the neck, his head then severed from the body, the body divided into four quarters; and the head and quarters to be at the disposal of the crown. But in 1870 these barbarities were repealed, and the sentence is now changed into hanging. The consequence of a conviction of treason was forfeiture and corruption of blood; the corruption of blood having the effect that the attainted person could neither inherit lands from his ancestor, nor transmit them to any heir. But this was altered as regards England and Ireland in 1870 by the statute 33 and 34 Vict. c. 23. The convict forfeits and is disqualified for any public office; the court may order him to pay the costs of his conviction, and his whole property is transferred to administrators named by the crown, who administer it and retransfer the surplus to his heirs and representatives.

There are certain minor offenses which are called misprision of treason, being those closely bordering on treason. Such are offenses which consist in the bare knowledge and concealment of treason, without any degree of assent thereto, for any assent makes the party a principal traitor. If a person, knowing of the treason, do not forthwith reveal it to some judge of assize or justice of the peace, this is the crime of misprision of treason. The punishment of misprision of treason was loss of goods and lands during life. Another offense closely related to treason is the willfully pointing a gun at, or attempting to strike, the person of the sovereign, with intent to injure him (or her); the offense being recently reduced, by statute 5 and 6 Vict. c. 51, to one punishable with three years' imprisonment. There is also a cognate offense created by 11 and 12 Vict. c. 12—that of intending to depose the queen, or levying war against her in order to intimidate her or the houses of parliament. The offense of *præmunire* (q.v.) was originally the introducing a foreign power into the country, and the name was extended to similar offenses. In the United States T. may be either against an individual state or against the United States. In the former case it is an offense at common law. By the constitution (art. 3, sec. 3) treason against the United States consists in levying war against them, or in adhering to, or giving aid and comfort to, their enemies. It is further provided that no person shall be convicted of treason unless on the testimony of two witnesses to the overt act or upon confession in open court. The penalty is death. A conspiracy to commit treason does not constitute the crime, unless followed by overt acts. In the meaning of the term "enemies" of the United States, pirates or robbers actually invading our territory are included.

TREASURER, LORD HIGH, the name given to the third great officer of the crown in England, who, in former times, was sole head of the king's exchequer. In the reign of William I. a separate board and court for matters of revenue was appointed after the model of the exchequer of Normandy, and a treasurer and other officers were appointed for transacting business relating to the royal revenue. Odo, earl of Kent, was the

earliest holder of this office; but the early treasurers were for the most part churchmen. The functions of the treasurer were often discharged by the chief justiciary, and the offices of justiciary and treasurer seem not to have been completely separated till the reign of Stephen. The office of lord high treasurer was for the first time put into commission by James I. in 1612; and from the accession of George I. down to the present time, it has been the practice to vest the office in a board of lords commissioners of the treasury. See TREASURY. In Scotland, a similar office existed prior to the union; and there were also lords high treasurers appointed in Ireland. On the union of 1707, the lord high treasurer of England became the lord high treasurer of Great Britain; and in 1816, by statute 56 Geo. III. c. 98, on the consolidation of the same offices in England and Ireland, he was constituted the lord high treasurer of the United Kingdom.

TREASURE-TROVE is the finding of hidden treasure in the earth, the word treasure meaning coin, gold or silver plate, or bullion. By the law of England, he who finds such things hidden in the earth is not entitled to them, but they belong to the crown. This is an exception to the general rule, that he who first finds a thing, whose owner is unknown, is entitled to keep it; and accordingly the exception is construed strictly, so that if the coin, etc., is not hidden in and covered by the earth, the finder, and not the crown, is entitled to it. If it is treasure-trove in the strict sense above described, then it is the duty of the finder to give notice to the crown; and to conceal it or appropriate it is an indictable offense, punishable by fine and imprisonment. In India, the importance of treasure-trove led, in 1878, to the passage of the Indian Treasure-Trove Act. By this act, the finder holds it, if no owner can be found; if he is found, he may have one-fourth, and the finder the remaining three-fourths. The Government, however, reserves the right of purchase by the payment of one-fifth more than the value of the material.

TREASURY, that department of the executive of the government of the United Kingdom which has the control of the revenue and expenditure of the country. The head of the treasury was in former times an officer called the lord high treasurer (see TREASURER, LORD HIGH), but his office has ever since the accession of George I. been executed by lords commissioners, who have become his permanent representatives. The treasury board now consists of the prime minister (generally styled first lord of the treasury), the chancellor of the exchequer, and three junior lords of the treasury, who have usually seats in parliament, as have also the two joint-secretaries of the treasury. The first lord being the head of the administration, his duties are not limited to the treasury, which is chiefly conducted by the other members of the board. The chancellor of the exchequer, who holds under a distinct patent the office of under-treasurer, is the effective head of the treasury, exercising the most responsible control over the expenditure of the different branches of the service, as also over all works demanding unusual outlay in the naval, military, and civil departments, either at home or in the colonies. He prepares an annual estimate of the expenses of the country, and of the ways and means by which they are proposed to be met; and this statement, known as the budget, is submitted by him to the house of commons. The prime minister, when a member of the house of commons, has occasionally held at the same time the office of chancellor of the exchequer. The duties of the junior lords are in a great measure formal: the heaviest portion of the executive functions of the treasury devolves on the secretaries.

The function of payment has ever since the restoration been completely separated from the custody of the public revenue, the former only being vested in the treasury, while the latter belongs to the exchequer. By an arrangement effected by 4 and 5 Will. IV. c. 15, the revenue flowing into the treasury is paid into the bank of England, to the credit of the comptroller-general of the exchequer, and all payments on the public accounts are made pursuant to a warrant or order of the treasury. No moneys voted by parliament can be drawn from the exchequer without the warrant of the treasury board, nor can any payment be made from the civil list without its authority.

The duties of the treasury board are numerous. The supplies for the army, navy, and civil service are issued under its authority. In virtue of various statutes, it has the regulation of the salaries of newly created officers in other departments, and of the number of officers in the establishments for new branches of the public service. The duties of the treasury also comprise the examination of the expenses of legal establishments, sheriffs, county courts, and criminal prosecutions. All payments for civil salaries, allowances, and incidental charges payable in England, and all payments for the army, navy, and ordnance, are made upon the special authority of the treasury by the paymaster-general. The boards of customs and inland revenue, and the post-office, are subject to its general authority. The office of woods and forests now discharges many of the duties which formerly devolved on the treasury, but is subject to its regulations. The establishments of colonial and other offices are also subject to the control of the treasury with regard to their expenses. The treasury may be appealed to against the decisions of subordinate departments in all cases connected with the receipt of revenue. The treasury possesses the patronage of the departments immediately subordinate to it. The church patronage of the crown—except that which belongs to the lord chancellor—is usually disposed of on the advice of the first lord of the treasury; and the foreign and colonial secretaries, in all important appointments falling under their patronage, are in the practice of consulting the first lord of the treasury.

TREASURY OF THE UNITED STATES, the department of the executive government in which is vested the management of the national revenues. Its principal officer is the secretary of the treasury, whose position, though commonly supposed to be inferior to that of the secretary of state is really more important and responsible, except in certain rare emergencies. Besides the secretary there are 2 assistant secretaries, a treasurer, a registrar, a solicitor, 3 comptrollers, 6 auditors, commissioners of internal revenue and of customs, and some 16,000 employees, of whom about 3,000 are at Washington, and the rest in the internal revenue department or the sub-treasuries and custom-houses. Among the most important of the 18 bureaus into which the treasury department is divided are the coast survey, the bureau of statistics, and the mint.

TREAT, ROBERT, 1622-1710; b. England; emigrated to this country with Saltonstall, and became a judge in Milford, Conn. In 1675, when Springfield was attacked by Indians, he headed a relieving party and defeated the enemy at Hadley, and took part in the battle at Narragansett fort. He was lieutenant-governor, 1676, and governor, 1683-98.

TREAT, SELAH B., D.D., 1804-77; b. Hartford, Conn.; d. Boston. He graduated at Yale coll., 1824; took up the practice of law, but gave it up to study for the ministry; graduated at Andover theol. sem., 1835, and became pastor of the Pres. church, Newark, N. J., 1836, resigning in 1840 to become editor of the *Biblical Repository and American Eclectic*. He was sect'y of the American Board, 1843-47, and corresponding sect'y, 1847-77, and was highly esteemed for faithful service.

TREATY, in public law, an agreement of friendship, alliance, commerce, or navigation, entered into between two or more independent states. Treaties have been divided by publicists into *personal* and *real*, the difference being that the former relate exclusively to the persons of the contracting parties—for example, treaties guaranteeing the throne to a particular sovereign and his family—and the latter are treaties for national objects, independent of the rulers of the state. While personal treaties expire with the death of the sovereign, or the extinction of his family, real treaties bind the contracting parties independently of any change in the sovereignty of the states. The constitution of each particular state must be looked to, to determine in whom the power of negotiating and contracting treaties with foreign powers resides. In monarchies, whether absolute or constitutional, it is usually vested in the sovereign. By the constitution of Great Britain, the exercise of this power is subject to parliamentary censure; ministers who advise the conclusion of any treaty which shall afterward be judged derogatory to the honor, or disadvantageous to the welfare of the nation, being liable to impeachment, a proceeding of which English history affords numerous instances; as the impeachment of De la Pole, earl of Suffolk, in 1451, for making a convention of peace without the assent of the privy council; of Wolsey, in 1529, by the house of lords, for making treaties without the king's knowledge; and of the earl of Orford by the commons, in 1701, for advising treaties for dividing the dominions of Spain. In republics, the chief magistrate, senate, or executive council is intrusted with the exercise of this sovereign power. The constitution of the United States of America (art. ii, sec. 2) vests it in the president, with the advice and consent of the senate. No special form of words is necessary for the validity of a treaty; but modern usage requires that an agreement which has originally been verbal, should as soon as possible be committed to writing. There are certain compacts between nations which are included in the exercise of a general implied power confided to certain public agents as incidental to their official position. Such are the acts of generals or admirals limiting hostilities by truces, capitulations, or cartels for the exchange of prisoners, which do not require the ratification of the supreme authority, unless there be a reservation making that necessary. In other cases, however, a public minister or other diplomatic agent is not entitled to conclude or sign a treaty with the foreign power to which he is accredited, without a full power independent of his general letter of credence. Even in the case of a treaty concluded with full powers, it is often considered expedient to have a special ratification by the sovereign, or other proper authority of the state contracting.

A treaty is considered to be extinguished when one of the contracting powers loses its existence as an independent state, when the internal constitution of either state is changed so as to make it inapplicable; and in case of war between the contracting parties, unless the stipulations of the treaty have been expressly with a view to the rupture. As there is often a difficulty in distinguishing stipulations perpetual in their nature from those that are extinguished by war, it is common to insert clauses in treaties of peace reviving and confirming the treaties formerly subsisting between the contracting parties.

A *Treaty of guaranty* is an engagement by which one state promises to aid another when it is disturbed, or threatened to be disturbed, in the peaceable enjoyment of its rights by a third power.

Treaties of alliance may be offensive or defensive: in the former, the ally engages generally to co-operate in hostilities against a specified power, or against any power with which the other may be at war; in the latter, the engagements of the ally extend only to a war of aggression commenced against the other contracting party.


The execution of a treaty is occasionally secured by hostages; as at the peace of

Aix-la-Chapelle, in 1748, when several peers were sent to Paris as hostages for the restoration of cape Breton by Great Britain to France.

TREBBIA, a small but famous stream of Italy, rises in the Ligurian Apennines, near Montebello, flows northward through a mountain valley for the greater part of its course, and joins the Po, two m. w. of Piacenza. Its entire length is about 60 miles. Here Hannibal decisively defeated the Roman consul Sempronius, 218 B.C.

TREBIGNE, a t. formerly in the Turkish vilayet of Bosnia, now belonging to Herzegovina; in the district of Mostar.

TREBIZOND, or **TREBISOND** (in Turkish, *Tarabezân*), is a Turkish vilayet in the n.e. of Asia Minor, stretching along the s.e. shore of the Black sea, for 240 m., with an estimated pop. of 1,047,000. The surface is mostly mountainous, the slopes toward the sea being thickly wooded. The eastern portion of the vilayet is known as Lazistan, from its inhabitants, the Lazi, a savage, vindictive race, distinguished among their neighbors for their barbarous manners and predatory habits. The port of Batoum and a part of Lazistan, on the Russian frontier, were ceded to Russia in 1878. Next to Trebizond, the most important places in Trebizond are Samsoun, Kerasun, and Gumish-Khaneh. The chief town of the vilayet is **TREBIZOND**, a flourishing sea-port city, on the Black Sea coast, about 110 m. n.w. of Erzerum. It is surrounded by walls of great extent, which inclose numerous gardens as well as the town itself, and is inhabited by a pop. (1889) of 45,000, chiefly Moslems. Outside the walls are various suburbs, where most of the Christian inhabitants reside, and in which the principal bazaars and khans have been established. The city is defended by several forts along the walls, and by a fortified citadel perched upon a high rock on one side of the town. It possesses an excellent harbor, which, however, is only considered safe during the summer months, the roadstead of Platena, 7 m. to the west, being employed for the rest of the year. There are numerous mosques and "medresses," churches for Greek Christians, copper foundries, dye-works, etc. The geographical position of Trebizond is, in a commercial point of view, rivaled only by that of Alexandria, and has made it the great entrepôt of the commerce between eastern Europe and central Asia, and the second commercial city of the Turkish empire. European goods are brought hither, since 1836, by regular services of steamers from Constantinople and the mouths of the Danube; and those of Asia by caravans from Erzerum, Tabriz, and Syria. The goods brought overland embrace silk, wool, tobacco, wax, gallnuts, oil, opium, drugs of various kinds, honey, timber, carpets, and shawls; and those arriving by sea are principally cotton cloths, glass, cutlery, fire-arms, as well as grain, iron, tin, spices, etc. Trebizond is the ancient *Trapezus*, and was founded by a colony from Sinope; it was a flourishing town under the Colchians, when Xenophon arrived there in his famous retreat from Persia. Conquered from Mithridates by the Romans, it rapidly rose in importance, became a free city, was made by Trajan the capital of Pontus Cappadocicus; and, by the same enlightened ruler, was provided with a larger and better harbor. On the capture of Constantinople by the crusaders in 1204, and the expulsion of the Comnenian emperors, one of the imperial family, Alexis, established himself at Trebizond, where he had previously exercised the functions of governor, and founded a state known as the *Empire of Trebizond*, which stretched from the Phasis to the Halys, and maintained its independence against the Turks till 1462, when the last emperor was defeated and captured by sultan Mohammed II.

TREBLE, the highest part in harmonized music, which in general contains the melody, and is sung by a soprano (q.v.) voice. The treble or G clef  is placed on

the second line of the staff, indicating that the note G occupies the line encircled by its lower curve. It is one of the two clefs in use in music for keyed instruments.

TREDEGAR, a market t. on the n.w. border of Monmouthshire, 18 m. n.w. of Newport. It stands in the midst of a district with extensive iron-works and coal-mines, which give employment to the great mass of the inhabitants. Pop. in '91, 17,484.

TREDGOLD, THOMAS, a celebrated English authority on architecture and engineering, was b. at Brandon, a small village $2\frac{1}{4}$ m. s.w. of Durham, Aug. 22d, 1788. At the age of 14 he was apprenticed for six years to a cabinetmaker; but devoted his leisure time to the study of the principles of architecture, and kindred subjects. In 1808 he went to Scotland, where he worked as a journeyman carpenter for five years; then removed to London to his relative Mr. Atkinson, the architect to the ordnance board, with whom he labored till 1823, by which period his private business had increased so much that he commenced business on his own account as a civil engineer. During the ten years of Tredgold's residence with Mr. Atkinson, he studied with redoubled zeal, and obtained a thorough acquaintance with mathematics, chemistry, mineralogy, and geology. He died from pure exhaustion of nature, Jan. 28th, 1829, at the early age of 40. Tredgold's scientific contributions to periodicals range over a wide field; but his great and valuable works are: *The Elementary Principles of Carpentry*, a *Treatise on the Pressure of Beams and Timber Frames*, *the Resistance of Timber*, *the Construction of*

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TREES, ETC.—1. Giant redwood (*Sequoia gigantea*); b, cone. 2. Oriental cypress (*Cupressus orientalis*). 3. Oriental cypress (*Cupressus orientalis*). 4. Oriental cypress (*Cupressus orientalis*). 5. Banyan (*Ficus religiosa*). 6. Pistacia nuts (*P. vera*). 7. Fruit of yew (*Taxus paradisica*).



1. *Pinus fastigiata*. 2. *Pinus fastigiata*. 3. Date palm (*Phoenix dactylifera*) and fruits. 4. Fig (*Ficus carica*).
 5. Brazil-nuts or Para-nuts (*Bertholletia excelsa*). 6. Flower of plantain (*Musa*

Floors, Roofs, Centers, and Bridges (4to, 1820; 2d ed., 1828); and the *Strength of Cast Iron* (1821; 2d ed., 1824; 3d ed., 1831). His other works, the *Principles of Warming and Ventilating Public Buildings*, etc. (1824); *Practical Treatise on Railroads and Carriages* (1825); a pamphlet entitled *Remarks on Steam-Navigation*, etc. (1825); and *The Steam-Engine* (1827), were also received with special favor; and of the first and last of them new editions were speedily required.

TREE, the name given to those plants which live for many years, and have woody stems and branches, the stem being generally single, and bearing a head of branches and twigs; whereas shrubs (q.v.) have generally a number of stems springing from one root. The terms tree and shrub are not, however, of very exactly defined signification; and many shrubs, under certain circumstances, assume the form of trees, either naturally or by the help of art; while trees are, in other circumstances, converted into shrubs. The common hawthorn, for example, is very often a mere shrub, but sometimes appears as a tree, with stem and head as perfect as the greatest monarch of the forest. The gooseberry bush is usually trained in our gardens in a tree-like habit, notwithstanding its small size, and the shortness of its stem; this, however, is entirely artificial, its natural habit being that of a shrub, to which, but for the gardener's knife, it would almost certainly relapse in a single year. The greater number of trees are exogenous. Palms are almost the only endogenous plants to which this name can be given. Very different from the ordinary exogenous trees are the gymnogens (q.v.) of Lindley—firs, pines, yews, etc. Trees are found in all climates except the coldest, but the number of species, as well as the luxuriance of the forests, is greatest in the tropics. As we advance toward the polar regions, or ascend high mountains, trees disappear before other forms of vegetation. The different characters of trees affect very much the landscape of the countries in which they grow; some countries, and particularly in northern parts of the world, being covered with somber pine forests, while others abound in ash, beech, and similar trees of verdant foliage. Every kind of tree has its peculiar character, not only in its foliage, but in its general form and its mode of branching. An ash is as easily distinguished from an elm, by a practiced eye, in winter, when destitute of leaves, as in the full foliage of summer. Some trees attain a very great age, but the ordinary duration of life is very different in different species. There are trees in England which are supposed to be more than a thousand years old, and are still healthful and flourishing. Oaks and yews are among the trees of longest life. The baobab of Africa is also regarded as a very long-lived tree.

No acotyledonous plant assumes the character of a tree, except a few ferns, known as tree ferns. See ARBORICULTURE.

TREE, HERBERT BEERBOHM. See BEERBOHM-TREE, HERBERT.

TREE-FERNS are ferns with tree-like woody stem, and a head of fronds resembling the leaves of palms. They are found only in tropical and sub-tropical countries, many of which, however, are quite destitute of them. One species, *Alsophila gigantea*, which has a thick black trunk surmounted by a feathery crown, is found in the Himalayas, at an elevation of 7,000 ft., and might be introduced with some probability of success into Britain. The soft central part of the stem of *Cyathea medullaris* is an article of food in New Zealand. Tree ferns are a characteristic feature of the vegetation of New Zealand.

TREE-FROGS, *Hyladæ*, a family of *batrachia* (q.v.) separated from the true frogs (*ranidæ*) on account of the dilated disks or suckers at the tips of the toes, which are covered with a viscid secretion, and enable the animals to climb trees. Most of them are arboreal; they are of small size, more elegant in form than the true frogs, of brighter colors and more active habits. They feed on insects, which they pursue on the branches and among the leaves of trees or shrubs, stealing toward them, and suddenly springing upon them. They deposit their spawn in water, like other batrachians—some of them on the edges of leaves hanging over water—and hibernate in mud. The day is their time of activity, although they shelter themselves among leaves from very hot sunshine. Their croaking is louder than that of true frogs, and the traveler is sometimes amused by hearing it from the tops of high trees. No species of tree-frog is found in Britain; one occurs in the middle and south of Europe; it is also found in Asia and the north of Africa; the warmer regions of the old world have numerous species, and in America they are still more abundant. Some occur in Australia. The TREE-FROG of Europe (*hyla arborea*)—*rainette* of the French—is found chiefly in moist woods, and in hedges near water. Although a small creature—one of the smallest of European frogs—it can make a spring of more than a yard in height to seize an insect. It becomes very noisy on the approach of rain, and is often kept in confinement to serve as a kind of barometer. Very similar to it is the COMMON TREE-FROG of North America (*H. versicolor*), which is abundant in the middle and northern parts of the United States as far w. as the Mississippi, but is replaced in the s. by the GREEN TREE-FROG (*H. viridis*), while other species are found in different parts of the country. See illus., BATS, ETC., vol. III.

TREES OF LIBERTY. The custom, common to almost all the nations of Europe, of celebrating the beginning of spring and various national and ecclesiastical festivals by setting up green boughs, led, during the war of independence in the United States, to the habit of planting poplars and other trees as the symbol of growing freedom. This

example was imitated during the French revolution. The Jacobins in Paris are said to have planted the first tree of liberty in 1790; and the custom spread rapidly through the whole of France. These trees, crowned with the cap of liberty, were soon to be found in every village, while the people danced round them, singing revolutionary songs, and regarded them as the rendezvous of the patriots. Poplars were at first employed, but afterward oaks were substituted in their place. This custom was regulated by a decree of the convention, and diffused over foreign countries by the republican armies. During the reign of terror, thousands lost their lives under the pretext of having injured a tree of liberty. During the empire, this custom, like all others that had originated during the republic, was completely suppressed. In the July revolution of 1830, trees of liberty were again set up, particularly at Paris. But the populace took no interest in the matter. During the February revolution of 1848, trees of liberty once more came into vogue at Paris and other places where the inhabitants held republican principles. They were generally hung with tri-colored ribbons, circles, and triangles, the symbols of unity and equality, and surmounted with the cap of liberty. In Paris, on the occasion of erecting a tree of liberty, a priest was frequently conveyed to the spot for the purpose of consecrating it. After most of the trees of liberty had fallen during the conflicts in the streets of Paris in June, 1848, government issued an order for their removal from all places where they impeded traffic. Before the end of the year they had entirely disappeared. Numerous trees of liberty were erected in Italy during the revolution of 1848 and 1849, but fell as the different insurrections were quelled. A learned and interesting treatise has been written on this subject by the Abbé Grégoire.

TREFOIL, a name given to many herbaceous plants with leaves of three leaflets, as clover (q. v.), lotus (q. v.), medick (q. v.), buckbean (q. v.), etc.

TREFOIL, in heraldry, is a frequent charge, representing the clover-leaf, and is always depicted as *slipped*, i. e., furnished with a stalk.

TREGELLES, SAMUEL, LL.D., an eminent New Testament critic and editor, was born at Falmouth in 1813. He did not receive a university education, and spent the early part of his life in secular occupation, yet at the age of 25 he had formed the plan of a Greek New Testament, on the principles which he afterward carried out. In preparing for his *magnum opus*, he visited the continent in search of MSS., and published, among other works, an edition of the *Codex Zacynthius*; an *Account of the Printed Text of the Greek New Testament* (1854); and an *Introduction to the Textual Criticism of the New Testament* (1856). His *Critical Edition of the Greek New Testament* was published in 1857-72, and stands, as to manner of treatment, between that of Lachmann and that of Tischendorf. Tregelles goes further than Tischendorf in his dependence upon ancient, and rejection of modern MSS. In 1862 Tregelles received a pension of £100, which was doubled in 1870. He died on April 24, 1875.

TREGG, a co. in w. central Kansas; 900 sq. m.; pop. '90, 2535. Co. seat, Wakeeney.

TREITSCHKE, HEINRICH GOTTHARD VON, German historian, 1834-96, educated at the universities of Bonn, Leipsic, Tübingen and Heidelberg. He became *privatdocent* in history at Leipsic in 1858, and professor at Freiburg 1863, resigning three years later, to become editor of the *Preussische Jahrbücher*, to which he had been for many years a diligent contributor. In the autumn of the same year he was appointed professor at Kiel, in 1867 was called to the chair vacated by Häuser's death, at Heidelberg, and in 1874 became professor at Berlin. During 1871-88 he was a member of the Reichstag, adhering to the national party. He resigned the editorship of the *Preussische Jahrbücher* in 1888. After Ranke's death he became Prussian state historian, in 1895. His principal work is *Deutsche Geschichte im 19. Jahrhundert* (Leipsic, 1879-94) covering the period down to 1848. Of his numerous other writings, may be mentioned *Zehn Jahre deutscher Kämpfe, 1865-74*; *Schriften zur Tagespolitik* (1874-79); *Der Sozialismus und seine Gönner* (1875); *Ein Wort über unser Judenthum* (1880); *Zwei Kaiser* (1888); and the posthumous volumes, *Reden im deutschen Reichstag*, and *Biographische und historische Abhandlungen* (1897).

TRELAWNEY, EDWARD JOHN, 1792-1881, author, especially known as the friend of Shelley and Byron. In 1821, while living at Pisa, he made the acquaintance of Shelley, and in 1823 accompanied Byron to Greece, where he took part in the war of liberation, marrying the daughter of the Greek chieftain Odysseus. In 1827 he returned to England. Besides articles for magazines, he wrote *The Adventures of a Younger Son*, but he is better known for his *Recollections of the Last Days of Shelley and Byron* (1858), which appeared in 1878 (new edition 1887) under the title of *Records of Shelley, Byron and the Author*.

TREMATO'DA, or TREMATODE WORMS, constitute, according to Dr. Cobbold's system; the second order of the sub-class *sterelmintha* (Owen), of the class *helmintha*. In ordinary zoological classification, the trematoda form a division of the group of *platyelmia* or "flat-worms," which group is in its turn included in the class *scolecida*—a division of *echinozoa* or *annuloida*. This order, as the Greek word *trêmátodes* indicates, is characterized by the possession of certain suckorial pores or openings. All the animals included in it have soft, roundish, or flat bodies, and their visceral organs are lodged in the parenchyma of the body. Most of the trematoda are hermaphrodites. They seldom attain to a large size (the greatest length is about 5 in.), but are usually visible to the naked eye. Like all *scolecida*, the trematoda possess a peculiar system of vessels ramifying through their bodies, and termed the "water-vascular" system.

The trematoda, or flukes, as they are popularly called, from their resemblance in form to small flukes or flounders, are not parasitic during the whole period of their existence; "for, while passing through the cycle of their life-development, they frequently change their residence, at times inhabiting either open waters, or the dewy moisture of low pasture-grounds. They perform active and passive migrations from parasitic to non-parasitic abodes; and during their larval wanderings in search of a final resting-place which should prove suitable to their adult condition, they provisionally occupy the bodies of different kinds of invertebrata."—Cobbold's *Entozoa*, 1864, p. 15. In his *Synopsis of the Distomida* (published in 1861), Dr. Cobbold recognizes 344 species of flukes, of which 126 belong to fishes, 47 to reptiles, 108 to birds, 58 to mammals, and 5 to the invertebrata. He now believes that, at the very lowest possible estimate, we must assume the order to contain 400 species, which may be divided into the five families of *monostomida*, *distomida*, *tristomida*, *polystomida*, and *gyrodactyla*—names which are based, except in the last case, on the number of their pores or oval suckers.

Van Beneden arranges these families into (a) *monogenea* and (b) *digenea*, the development in the former being simple, while in the latter there is an alternation of generation, the nurses and larvæ living chiefly in mollusks, while the adult animals chiefly live in the bodies of vertebrate animals. The *monostomida* and *distomida* belong to the latter, and the others to the former group. The family of *distomida* embraces the principal and best-known genera of the order *trematoda*, and its members are at once recognized by the presence of two pores or suckers; one, the anterior, being connected with the mouth; and the other, termed the acetabulum, being usually placed on the ventral surface, in the middle line.

The following members of this order are of special interest, as very liable to infest man: *Fasciola hepatica*, described in the article FLUKE, is not only common in all varieties of grazing-cattle, and especially the sheep, but has been found in the horse and ass, in the hare and rabbit, in the squirrel, beaver, kangaroo, etc., and is occasionally met with in man, not only in the liver and gall-bladder, but beneath the skin in various parts, as, for example, in the sole of the foot, behind the ear, and in the scalp. For an excellent account of the anatomy and development of this parasite, the reader is referred to Cobbold, *op. cit.* pp. 147–169. See ROT. *Distoma lanceolatum* is a species which is by no means uncommon in the sheep and ox, and has been found on at least three occasions in the human subject. *Distoma ophthalmobium* has been occasionally found in the lens of the human eye. *Distoma hæmatobium*, or *Bilharzia hæmatobia*, as Dr. Cobbold terms it, is the only known trematode which is not hermaphroditic.

The male is a cylindrical worm, measuring only about half an inch in length; while the female is filiform, longer, and much narrower than the male, being about $\frac{3}{4}$ of an inch in length. The first specimens were found by Bilharz of Cairo in the portal system, and the worm has since been found in the veins of the mesentery, bladder, and other parts. This parasite is common not only along the borders of the Nile, but in south Africa and the Mauritius. It is so common in Egypt that in 363 examinations of the body after death, Griesinger found it no less than 117 times.

The principal feature of the disease caused by this worm consists in a general disturbance of the uropoietic function. Diarrhea and hæmaturia occur in advanced stages of the complaint, being also frequently associated with the so-called Egyptian chlorosis, colicky pains, anæmia, and great prostration of the vital powers. The true source of the disorder, however, is easily overlooked, unless a careful microscopical examination be made of the urine and other evacuations. If blood be mixed with these, and there also be a large escape of mucus, a minute inspection of the excreta will scarcely fail to reveal the presence of the characteristic ova of *bilharzia*.—Cobbold, *op. cit.* p. 202. Dr. J. Harley has published several excellent papers "On the Hæmaturia of the Cape of Good Hope, produced by a *Distoma*," which is undoubtedly the *bilharzia*.

Several other trematodes occasionally occur in the human subject.

TREM'OLITE a mineral regarded as a variety of hornblende (q. v.). It is composed of silica, magnesia, lime, and a very little fluoric acid.

TREM'OLO, TREMAN'DO (Ital. trembling), in music, an expression indicating that a note or a chord is to be reiterated with great rapidity for an indefinite number of times, so as to produce a tremulous sort of effect.

TREMPEALEAU', a co. in w. Wisconsin; 732 sq. m.; pop. '90, 18,920, chiefly of American birth. Its surface is generally level, a large proportion woodland. Live stock is raised in great numbers. Co. seat, Whitehall.

TRENCH, RICHARD CHENEVIX, Archbishop of Dublin, divine and scholar of the church of England, belonged to an Anglo-Irish family of Galway, the Trenches of Woodlawn, and was born at Dublin, Sept. 9, 1807. He was educated at Harrow and Trinity college, Cambridge, where he graduated in 1829. After traveling for a few years he became a country curate; and in 1837 or 1838, published two volumes of poetry, which had at least the merit of imitating Wordsworth, and were favorably received. One of the poems, *The Story of Justin Martyr*, is even yet faintly remembered. In 1844, Trench was presented to the rectory of Ithen-Stoke; in 1847 he became theological professor and examiner in King's college, London; in 1856, dean of Westminster; and in 1864, on

the death of Whately, archbishop of Dublin. He resigned in 1884. He had a quick, keen understanding; his scholarship was varied and choice, though not sufficiently precise or scientific for philological purposes; his fancy, sometimes poetic, and always picturesque, enabled him to invest the dry discussion of words with a peculiar fascination; and if the results of his etymological inquiries were not always sure, the processes were invariably pleasant. As a literary critic, Trench was both acute and elegant. His principal works are: *Notes on the Miracles* (1846); *Notes on the Parables* (1841; 15th ed. 1884); *The Lessons in Proverbs* (1853), from all of which his professional brethren have borrowed liberally for the work of the pulpit; *The Sermon on the Mount, illustrated from St. Augustine* (1844); *Sacred Latin Poetry* (1849); *St. Augustine as an Interpreter of Scripture* (1851); *Synonyms of the New Testament* (1854); *The Epistles to the Seven Churches of Asia Minor*; *An Essay on the Life and Genius of Calderon*; *Deficiencies in our English Dictionaries*; *Glossary of English Words used in different Senses* (1859); *The Study of Words* (1851), of which last, 22 editions appeared in America before 1862; a Memoir of his mother (1862); and *Lectures on Medieval Church History* (1878). He d. 1886.

TRENCHARD, STEPHEN D., b. N. Y., 1818; became a midshipman in the navy, 1834; served with much credit during the civil war, rising to the rank of commodore, 1871, and rear-admiral, 1875. In both attacks on Fort Fisher he commanded the *Rhode Island*. In 1869 he was flag officer of the South Atlantic squadron. He d. 1883.

TRENCK, FRANZ AND FREDERICK VON DER, were German barons and soldiers, whose adventures, recorded in autobiographies, have secured for them a world-wide fame. They were cousins, descended from an ancient house of east Prussia, and although placed from infancy under circumstances altogether different, exhibited a striking similarity of character. Both were braggarts, both were subject to fits of uncontrollable passion, and both told premeditated lies.

BARON FRANZ was b. in Reggio, in Calabria, on Jan. 1, 1711, where his father was an Austrian general. When 17 he received a commission as a cavalry officer, fought duels, and cut off the head of a man who refused to lend him money. He had to flee in consequence, and he went to Russia, where he was made a captain of hussars. He was then a formidable young giant of 6 ft. 3 in.; and it is highly probable that he knocked down his commanding officer, as he says he did, for rebuking him. He adds that he was placed under arrest while an engagement was going on; that marshal Münnich happening to pass, he called out that if set free and pardoned he would bring back three Turks' heads in an hour; that he was set free and brought back four Turks' heads suspended from his saddle. The story may or may not be true; but certain it is that he was cashiered not long afterward, and returned to settle on his estates in Croatia. There it is we first meet with the Trench of history. The Turkish frontier was overrun with banditti. Trench armed and drilled 1000 of his tenants, whom he called Pandours, and by their means succeeded in restoring order. He then offered the services of his regiment to Maria Theresa, and his aid was accepted. In 1740 he took part in the Silesian war at the head of his men, and perpetrated the most atrocious deeds of rapine and cruelty. There had been no such monster, says Mr. Carlyle, since Attila and Gerghis. On Sept. 7, 1742, he attacked Cham, a fine trading town in neutral territory, this act being, of course, in defiance of all law and discipline; and he completely annihilated it. After the battle of Sohr, in Sept., 1745, he offered to capture Frederick the Great, and bring him a prisoner to the Austrian camp. He failed in the enterprise, with great loss of men, but he secured the king's tent and much valuable booty. Suspicions were, however, entertained of his being in communication with the enemy, and he was tried by court-martial. He was imprisoned at Vienna, but made his escape with the assistance of the Baroness Lestock, who bribed the jailers to allow him to be conveyed in a coffin as if dead, beyond the city walls, was again captured at Bruges, and re-imprisoned at Grätz, where he took poison, and died on Oct. 4, 1749.—See Carlyle's *Life of Frederick the Great*; and *Memoirs du Baron Franz de Trench* (Par. 1787), written by himself.

FRIEDRICH VON DER TRENCK, was born at Königsberg, in 1726, and was the son of a maj. gen. in the Prussian service. He distinguished himself at the university. At 16 he became a cornet in the guards; and two years afterward the Princess Amelia, who saw him at a ball, we are told, conceived a violent passion for him. To this he attributed the antipathy the king afterward entertained toward him. There was, however, a much better reason: he was detected in a correspondence with his Austrian cousin, not long before the attempt to capture the king, and arrested. Mr. Carlyle shows that the baron had been in prison three months, and was there when the battle of Sohr took place, although he vividly describes his own adventures in the fight. He was accused of this lie in his own time, and admitted that he must have made a mistake! "He had nothing but his poor agitated memory to trust to." He was released on Dec. 24, 1763, and afterward settled at Aix-la-Chapelle, where he married the burgomaster's daughter, and went into business as a wine-merchant. He published his memoirs in 1786. The book was translated into all languages, and Trench became the most famous personage of his time. The ladies at Paris, Berlin, and Vienna wore bonnets, dresses, and rings *à la Trench*; and no less than seven plays, founded on his adventures, were brought out on the French stage. In 1793 he went to Paris, and became a zealous adherent of the mountain party. He was, however, suspected, and thrown into prison. Soon after, rumors in circulation among the prisoners that the Prussians were advancing on

Paris, and carrying all before them, were traced to Trenck, who was in consequence condemned. He was guillotined near the Barrière du Trône, July 26, 1794. On the scaffold, although 69 years of age, he manifested the ungovernable passion which had characterized him through life. He harangued the mob; and at length the executioner had by force to hold his head by the gray hair on the block, to meet the fatal stroke.—See Chambers's *Book of Days*, vol. i. p. 260; Carlyle's *Frederick the Great*, vol. iv.; *Friedrich Trencks Merkwürdige Lebensgeschichte von ihm selbst beschrieben* (2 vols. Berl. 1787); and *Leben und Thaten der Trenke*, by Watermann (2 vols. Leip. 1837).

TRENDELENBURG, FRIEDRICH ADOLF, 1802–72; b. Germany; educated at the universities of Kiel, Leipsic, and Berlin; appointed professor extraordinary of philosophy in the university of Berlin, 1833, and full professor, 1837. This position he held until his death. During the greater part of this period he held a governmental office in connection with the public schools. In the university he lectured to large classes on psychology, logic, history of philosophy, ethics, philosophy of law, and theory of teaching. His criticism on Kant involved him in controversies, while his assault upon Hegel procured him great renown, and did much to break the hold of Hegelianism on the German mind. The foundation of his own philosophic doctrine is Platonic and Aristotelian. He derives the principle for a philosophic deduction of the sensible universe from Aristotle's conception of motion, as subject to the principle of design or to Plato's *idea*. The teleological view he held and developed as illustrated and confirmed by empirical fact. Mechanical causation he viewed as the servant of teleology, not its enemy. He calls his philosophy the “organic view of the world.” Each lower stage in existence is the basis of the higher stages, and is involved in them. The highest stage experimentally known to men is the ethical, or the development of man in his totality; where his supreme end is intellectually apprehended, and is realized by man's own action. The soul is the self-realizing idea of man; God is the unconditional; not directly demonstrable but logically implied in the whole fabric of the universe and of human thought.

TRENT, a river of the midland counties of England, rises on the n.w. border of Staffordshire, about 10 m. n. of Burslem, and at a height of about 600 ft. above sea-level. It flows first s.e. to the border of Derbyshire, and afterward in a general n.e. direction, through the counties of Derby, Nottingham, and Lincoln, to a point about 8 m. e. of the town of Goole, where it unites with the Ouse (q.v.) to form the Humber (q.v.). It receives the Derwent, Idle, and Tarn from the w., and the Soar from the s.; its length is 170 m., for 120 m. of which, from its mouth up to Burton-on-Trent, it is navigable for barges.

TRENT (Ital. *Trento*, Ger. *Trient*, Lat. *Tridentum*), a walled t. of Austria, in the southern part of the Tyrol, capital of the circle of the same name, is situated on the left bank of the Adige, in a beautiful and fertile valley, surrounded by high limestone hills, 46 m. n. of Verona. In its general aspect, as well as its architecture, Trent is quite an Italian town; and with its spires and towers, ruined castles and ancient embattled walls, it presents an imposing appearance from a distance. Its cathedral (1812) is a handsome edifice of white marble. The *piazza grande*, near the cathedral is adorned with a splendid fountain of red marble, surmounted by a colossal statue of Neptune with his trident. There are a number of manufactures and a considerable trade. Pop. '90, 21,486.

The ancient *Tridentum*, or *Tridente*, derived its name from the *Tridentini*, an Alpine tribe, whose capital it was, and has, in all probability, no connection whatever with the *trident* of Neptune (as is commonly supposed). Conrad the Salic bestowed on the prince-bishops of Trent the temporal rule of the valley of the Adige, and under them Trent rose to great prosperity and importance. It is still the see of a prince-bishop.

TRENT AFFAIR, THE. In the autumn of 1861, the Confederate government sent John Slidell (q.v.) and James M. Mason (q.v.) to France and England respectively as commissioners. They ran the blockade at Charleston and went to Havana, where they embarked for England on the British mail-steamer *Trent*. On November 8, Capt. Wilkes, of the United States steamer *San Jacinto*, boarded the *Trent*, arrested the commissioners, and carried them to Fort Warren in Boston Harbor as prisoners. This act was applauded by the people of the United States, and by many of the leading statesmen; but President Lincoln strongly disapproved it, and when a formal demand was made by the British Minister for their surrender, it was speedily complied with and an apology tendered. Without, however, waiting to know the result of this demand, or, if Wilkes was upheld by his government, the British government began active preparations for war. See *Diplomatic Correspondence for 1861–62*.

TRENT, COUNCIL OF, the most celebrated of the assemblies regarded by the Roman Catholic church as ecumenical or general, and the great repository of all the doctrinal judgments of that communion on the chief points at issue with the reformers of the 16th century. Very early in his conflict with Pope Leo X., Luther had appealed from the controversies, a general desire grew up in the church for the convocation of a general council, in which the true sense of the church upon the controversies which had been raised might be finally and decretorially settled. Another, and, to many, a still more pressing motive for desiring a council, was the wish to bring about the reform of the alleged abuses as well of the court of Rome as of the domestic discipline and government of local churches, to which the movement of the reformers was in part at least

ascribed. But the measures for convoking a council were long delayed, owing partly, it has been alleged, to the intrigues of the party who were interested in the maintenance of those profitable abuses, and especially of the officials of the Roman court, including the cardinals, and even the popes themselves; but partly also to the jealousies, and even the actual conflicts, which took place between Charles V. and the king of France, whose joint action was absolutely indispensable to the success of any ecclesiastical assembly. It was not till the pontificate of Paul III. (1534-49) that the design assumed a practical character. One of the great difficulties regarded the place of meeting. In these discussions much time was lost; and, without entering into detail, it will suffice to say that the assembly did not actually meet till Dec. 13, 1545, when 4 archbishops, 22 bishops, 5 generals of orders, and the representatives of the emperor and the king of the Romans, assembled at Trent, a city of the Tyrol. The number of prelates afterward increased. The pope was represented by three legates, who presided in his name—cardinals del Monte, Cervino, and Pole. The first three sessions were devoted to preliminaries. It was not till the fourth session (April, 1546) that the really important work of the council began. It was decided, after much disputation, that the doctrinal questions and the questions of reformation should both be proceeded with simultaneously. Accordingly, the discussions on both subjects were continued through the fourth, fifth, sixth, and seventh sessions, in all which matters of great moment were decided; when a division between the pope and the emperor, who, by the victory of Mühlberg, had become all powerful in the empire, made the former desirous to transfer the council to some place beyond the reach of Charles's arbitrary dictation. The appearance of the plague at Trent furnished a ground for removal, and in the eighth session a decree was passed (Mar. 11, 1547) transferring the council to Bologna.

This translation was opposed by the bishops who were in the imperial interest, and the division which ensued had the effect of suspending all practical action. Meanwhile, Paul III. died. Julius III., who had, as cardinal del Monte, presided as legate in the council, took measures for its resumption at Trent, where it again assembled May 1, 1551. The sessions 9 to 12, held partly at Bologna, partly at Trent, were spent in discussions regarding the suspension and removal; but in the 13th session the real work of the assembly was renewed, and was continued, slowly, but with great care, till the 16th session, when, on account of the apprehended insecurity of Trent, the passes of the Tyrol having fallen into the hands of Maurice of Saxony, the sittings were again suspended for two years.

But the suspension was destined to continue for no less than nine years. Julius III. died in 1555, and was followed rapidly to the grave by his successor (who had also been his fellow-legate in the council as cardinal Cervino), Marcellus II. The pontificate of Paul IV. (1555-59) was a very troubled one, as well on account of internal difficulties as owing to the abdication of Charles V.; nor was it till the accession of Pius IV. (1559-65) that the fathers were again brought together to the number of 102, under the presidency of cardinal Gonzaga, re-opening their deliberations with the 17th session. All the succeeding sessions were devoted to matters of the highest importance—communion under one kind; the sacrifice of the mass; the sacrament of orders, and the nature and origin of the grades of the hierarchy; marriage, and the many questions connected therewith. These grave discussions occupied the sessions 17 to 24, and lasted till Nov. 11, 1563. Much anxiety was expressed on the part of many bishops, to draw the council to a conclusion, in order that they might be enabled to return to their sees in a time so critical; and accordingly, as the preliminary discussions regarding most of the remaining questions had already taken place, decrees were prepared in special congregations comprising almost all the remaining subjects of controversy, as purgatory, invocation of saints, images, relics, and indulgences. Several other matters, rather of detail than of doctrinal principle, were referred to the pope, to be by him examined and arranged; and on the 3d and 4th of Dec., 1563, these important decrees were finally read, approved, and subscribed by the members of the assembly, consisting of 4 cardinal legates, 2 other cardinals, 25 archbishops, 168 bishops, 7 abbots, 7 generals of orders, and 39 proxies of bishops—making in all 252.

These decrees were confirmed, Jan. 10, 1564, by Pius IV., who had drawn up, based upon them in conjunction with the creeds previously in use, a profession of faith known under his name. See ROMAN CATHOLIC CHURCH. The doctrinal decrees of the council were received at once throughout the western church, a fact which it is necessary to note, as the question as to the reception of the decrees of doctrine has sometimes been confounded with that regarding the decrees of reformation or discipline. As to the latter, delays and reservations took place. The first country to receive the decrees of the council as a whole was the republic of Venice. France accepted the disciplinary decrees only piecemeal and at intervals.

It would be out of place here to enter into the question as to the merits of this unquestionably great and momentous assembly, which may be said to have practically decided the religious destinies of the western church. It is viewed with directly opposite impressions by opposing critics, and it is commonly even said that in the Catholic church itself the council of Trent has met its worst adversary in the person of one of the priests of its own creed, the Servite monk, Fra Paolo Sarpi.

It must be confessed, however, that the most candid of modern inquirers have shown that Sarpi cannot fairly be regarded as a Roman Catholic. His sympathies are all strongly anti-Roman, and there are abundant indications in his work of a rationalizing

tendency, which plainly ought to rank him among the partisans of that free inquiry which it has been the object of Trent to repress by judgment, pronounced once for all, and excluding all controversy. See SARPI. And although there are, perhaps, equal exceptions against the impartiality of his rival historian and antagonist, Pallavicino, the latter is admitted by Ranke, Raumer, and others to be far more reliable in the use of documents than his Servite adversary.

The canons and decrees of the council of Trent were issued in Latin, and have been reprinted innumerable times. They have also been translated into almost every modern language; the most approved English translation being that of the Rev. Jeremiah O'Donovan. One of the supplementary works assigned to the pope by the council at its breaking up was the completion of a catechism for the use of parish priests and preachers. This work has not all the authority of the council, but it is of the very highest credit, and is extensively used, having, like the canons and decrees, been very generally translated. Another similar work was the publication of an authentic edition of the Vulgate version of the Bible, as well as of the missal and breviary. All these have been accomplished at intervals; and there is besides at Rome a permanent tribunal, a congregation of cardinals, styled *Congregatio Interpres Concilii Tridentini*, to which belongs the duty of dealing with all questions which arise as to the meaning, the authority, or the effect of the canons and decrees of this celebrated council. See SARPI, PIUS IV.

TRENTON, city, capital of New Jersey, and seat of Mercer co.; on the Delaware river, the Delaware and Raritan canal, and the Pennsylvania and the Philadelphia and Reading railroads; 30 miles n.e. of Philadelphia. It contains several public parks, the state capitol, the state penitentiary, the state hospital for the insane, the state school for deaf-mutes, state arsenal, U. S. government building, Mercer, city, and St. Francis hospitals, industrial school for girls, Union industrial home, Odd Fellows' home, widows' and single women's home, Y. M. C. A. building, state normal and model schools, and Protestant Episcopal and Roman Catholic cathedrals. The principal manufactures are pottery, iron and steel, woolen goods, flour, rubber, wire and cables, and oilcloth. The city has gas and electric lights, street railroads, about 50 churches, national, state, and savings banks, city and state libraries, and daily, weekly, and monthly periodicals. Here was fought, on Dec. 25, 1776, the battle between the British and Americans which proved the most decisive engagement of the Revolutionary war, and the event is commemorated by a handsome shaft surmounted by a figure of Washington. Pop. '90, 57,458.

TRENTON, city and co. seat of Grundy co., Mo.; on the Grand river and the Chicago, Rock Island, and Pacific, and the Quincy, Omaha, and Kansas City railroads; 84 miles n.e. of St. Joseph. It is the seat of Avalon college (United Brethren), and has a public high school, the Jewett Norris public library, national and state banks, coal mines, flour mills, creamery, electric lights, street railroads, waterworks, and daily and weekly newspapers. The surrounding country is principally devoted to farming and stock-raising. Pop. '90, 5039.

TRENTON FALLS, a village in Oneida co., N. Y., on the West Canada creek (a branch of the Mohawk river), and the New York Central and Hudson River and the Rome, Watertown, and Ogdensburg railroads; 17 miles n. by w. of Utica. It is a summer resort, famous for its series of falls in a deep ravine. Pop. '90, 284.

TREPAN. See TREPHINE.

TREPANG. See BÊCHE-DE-MER.

TREPHINE AND TREPHINING. (The instrument in its original form was called a *trepan*, from Gr. *trupao*, allied to Lat. *tereo*, to bore; the now usual form is called a *trephine*.) The operation of trephining consists in the perforation of a bone by means of a trephine, which is a small cylindrical or circular saw, with a center-pin on which it works. It is practiced on the skull in cases of fracture: "1st, when a portion of the bone is depressed, and encroaches on the cavity of the skull, producing compression of the brain, and the fragment cannot otherwise be raised; 2dly, for punctured fractures by which the inner table is splintered, separated from the outer table, and lying loose on the dura mater; and 3dly, for effusion of blood, or of inflammatory products between the bones and membranes, or between the latter and the brain, when it is presumed that the effused fluid may be evacuated by the opening."—Holmes's *System of Surgery*, vol. iv. p. 1044. It has likewise been employed in epilepsy, with the view of removing an assumed local cause of disturbance; but it is not likely to be ever again used in that disease, as it is now an established axiom, that as the operation itself may destroy life, its application is not justifiable, except as the last resource of surgery in extreme cases.

Attempts have been made by various surgical-instrument makers to regulate the action of the trephine by means of a movable collar, so as to prevent the brain from being injured after the skull has been perforated.

TRESCOT, WILLIAM HENRY, b. S. Carolina, 1822; educated at Harvard univ. He was sec. of legation at London, under Pres. Pierce; assist. sec. of state under Pres. Buchanan; practiced law in Washington, 1876; and the following year was counsel for the U. S., before the Halifax fisheries commission. He assisted in negotiating a treaty with China, 1880, and was sent, 1881, to South America to arbitrate difficulties between Chile, Peru, and Bolivia. He has written a book on American diplomacy.

TRESPASS is a term used in law in two general senses. In one aspect, its comprehensive meaning is some transgression or offence, which, in fact or in contemplation of

law, causes injury to the person or property of another; while, in its other phase, it denotes a form of remedy allowed by the law for injury inflicted. It will be discussed in both of these aspects. Considered in the former of these senses, the act of trespass may be committed either against the person of another, or with respect to his personal property, or upon his land or real property. When the injury is done against the person by the use of force threatened or actually employed, it constitutes either the tort of assault and battery or that of false imprisonment. As applied to injuries inflicted upon the person, the word trespass is most frequently used in this sense. But it is sometimes employed with a broader meaning, to indicate any injury to the life, limb, body, health, reputation, or personal liberty of an individual. It then includes such torts as libel, slander, nuisance, etc.

Trespass to chattels is "a wrongful injury to, or wrongful taking of, another's personal property." Thus, if one injure or destroy a chattel which belongs to another without taking it from the possession of the rightful owner, or if he wrongfully deprive such owner of its possession without doing it any injury, or if he do both of such wrongs, in either case he is guilty of trespass. When force or violence is used to accomplish the result, as if the chattel be wrested from the physical possession of the owner against his will, the wrong-doer may be sued in an action for trespass *vi et armis*. There is no crime involved in thus forcibly taking property from the possession of its owner, unless the act be done *animo furandi*—i.e., with an intent to commit a felony. The mere wrongful retention of the personality of another, even though it follow a trespass in the taking thereof, is not in itself a trespass, but constitutes the tort of conversion.

Trespass to real property is an unlawful entry upon the land of another. Every man's land is regarded by the law as surrounded and separated from that of his neighbors by a *close* or boundary. This may be a visible, tangible object, such as a fence or a hedge; but if none such exist, there is thrown around the land, in contemplation of law, an invisible, ideal boundary which effectually separates it from the property of all other persons. Any unwarrantable breaking through this *close*, and thereby entering or sending upon the land which it surrounds, even though no actual injury be done to the property, constitutes a trespass, for which an action at law will lie in favor of any one rightfully in possession when such act is done. No crime is usually committed by such a wrongful entry; and this is so even when the owner or rightful possessor has put up notices upon the land, as is so frequently done, stating that "Trespassers will be prosecuted," or using other words to that effect. If, however, the trespasser wantonly injure the property, as by breaking down the trees or crops, he may be criminally prosecuted for malicious mischief. A person may commit trespass for which he will be liable in a civil action for damages, not only by his own entry upon land, but also by wrongfully sending his personal property upon it or permitting it to go there. Thus, if he unwarrantably drive his cattle upon his neighbor's soil or negligently permit them to go upon it, he becomes liable to an action in trespass for the resulting damages. The common law also gives to the injured land-owner, in such cases, another remedy by permitting him to distrain or impound the cattle thus *damage-feasant*, or doing damage, until their owner renders him satisfaction for the injury sustained. At common law, one cannot be held liable for trespass merely because his dog or cat goes upon the land of another. This is because such animals are not kept for utility, as are horses, cows, and other cattle. But if a dog, or cat, or other such animal be known by its owner to have vicious propensities, and because of his failure to properly restrain it, it injure the person or property of another, he will be liable in damages. The establishing in court of such knowledge on his part of the vicious character of the animal is technically called proving "*scienter*." There are some circumstances under which entry upon the land of another without his consent is justifiable or excusable, and so does not constitute a trespass. Thus, if a public highway be so obstructed as to be impassable, a traveler may rightfully go around the obstruction upon the private land of an individual; and a person who, by virtue of a contract with another, has become the owner of personal property upon the latter's land, may enter and take it from such land; and again, when a vendor of personal property has rescinded the sale because of fraud practised upon him, he may enter upon the land of the vendee, if not forbidden by the latter, and retake the property sold, and the same rule holds whenever an owner of land has wrongfully acquired possession of the personality of another and placed it upon his own land. It is generally the rule, however, with these few exceptions, that a person who goes or sends upon the land of another, and takes his own chattels without permission of such land-owner, however such chattels may have come to be there, is guilty of a trespass. If a trespass be attempted upon real property, or upon personal property which is in the actual possession of its owner, the person rightfully in possession of the same may properly use all the force that is necessary to prevent the commission of the wrong. But if he employ more force than is actually needed to repel the violence of the intruder, he makes himself liable to an action for assault and battery, and his act may constitute a crime. Growing out of this right to make use of so much violence as is requisite to prevent intrusion is the well-known common law maxim, that "A man's house is his castle." Yet there are a few cases in which even the privacy of a person's dwelling-house may be invaded without his permission. An officer of the law, when executing criminal process—as in seeking to apprehend a criminal or one charged with a crime—may use the needed force to enter a building in which such person is secreted.

And even in the execution of civil process an officer may break open inner doors after he has peaceably obtained entrance into the house; but no civil process can authorize him to employ force or violence to obtain ingress through the outer door of a dwelling. There are, moreover, many circumstances under which persons are invited, by implication, to go upon the property of others, and so do not become trespassers, if, not being expressly forbidden to do so, they so enter. Thus, it is ordinarily no act of trespass for a person to enter the house of his neighbor upon matters of business or to make a social call; so keepers of stores, theatres, hotels, etc., hold out to the public a general invitation to enter upon their properties for the purpose of dealing with them. But even in such cases those who enter or remain against the express prohibition of the owner or proprietor become trespassers in so doing. If one go upon the property of another rightfully, but abuse or make ill use of the privilege or authority under which he entered, as if he go into a tavern or theatre and refuse to leave within a reasonable time or when ordered to do so, he thereby becomes a trespasser *ab initio*, or from the time when he entered.

The remedies allowed by the law for the injuries above outlined are an action of trespass and an action of trespass on the case. The distinction between these two forms of remedy is that the former is the proper action when the injury is directly inflicted with the use of force or violence, while the latter is appropriate when the wrong is done without resort to such means. Thus, if one throw a log of wood upon another, while the latter is walking along a highway, the proper action of the person so injured is trespass; but if one place a log of wood in a path, and leave it so that another falls over it in the darkness, the remedy of the latter for his resulting injury is trespass on the case. Trespass on the case lies for such injuries as those caused by a nuisance, libel, slander, etc. The action of trespass assumes various forms, according to the nature of the wrong that is committed. When it is brought for an act of violence against the person, either in injuring him or wresting his goods from him, it is trespass *vi et armis*; when for wrongfully taking away chattels, trespass *de bonis asportatis*; when for a wrongful entry upon real property, trespass *quare clausum fregit*. Such actions may be sustained, even though no actual injury is suffered, the law deeming it in itself a wrong to threaten injury to a person, or, without his permission, to take away his goods or break through the close which surrounds his land.

TRESSURE, in heraldry, a subordinary, generally said to be half the breadth of the orle, and usually borne double, and flowered and counter-flowered with fleurs-de-lis. It forms part of the royal insignia of Scotland, which are: or, a lion rampant gules, armed and langued azure, within a double tressure flory counterflory of the second.

TREVELYAN, Sir CHARLES EDWARD, b. England, 1807; educated at the Charterhouse and Haileybury College; entered the East India company's civil service, and was employed under Lord W. Bentinck and Lord Auckland. Through his efforts in the cause of native education the government was led to engage in the promotion of European literature and science among the natives. In 1840 he was appointed assistant secretary to the treasury, and in 1848 made Knight Commander of the Bath; governor of Madras, 1859; and received from the queen's government thanks for his valuable services; was appointed, 1862, financial minister in India, resigning in 1865 on account of ill-health. Important reforms were made in the system of accounts during his financial administration, and the resources of India developed by a great extension of public works. He was created a baronet in 1874. He is the author of *Education of the People of India* (1838); *The Irish Crisis* (1848); *Christianity and Hinduism* (1881). He d. 1886.

TREVELYAN EXPERIMENT (so called from the person who first carefully studied the phenomenon). When a block of iron or copper is considerably heated, and laid on a block of cold lead, a sound of some intensity, and more or less musical, is often heard. Trevelyan, after many trials, adopted for the "rocker," as it is called, a form somewhat resembling a fire-shovel, with a thickish block of metal instead of the blade. This is poised delicately on the lead block, so as to bear nearly equal pressure on two points separated by a groove; and the rounded end of the handle is also supported. The rocker being heated, suppose it poised so as to touch the lead at one point. It heats the lead at this point and therefore suddenly expands the metal near it, since lead is a bad conductor of heat. Thus, the lead, as it were, swells up at one point and tilts the rocker over to the other. There the same process takes place, and so on; and as the rocker thus moves alternately from one point to the other, the successive impacts, occurring at nearly equal intervals, form a musical sound. This can be altered at pleasure by loading the rocker, or by altering its moment of inertia. By proper care, almost any conducting body may be made thus to rock upon another, though, in the majority of combinations, the effect is very slight. The explanation of the phenomenon, as given above, is due to Faraday.

TRÈVES (Ger. *Trier*, Lat. *Augusta Trevirorum*), a t. of Rhenish Prussia (pop. in '71, 21,442; in '95, 40,026), capital of the circle of the same name, lies on the right bank of the Moselle, in a lovely valley, between vine-covered hills, about 65 m. s.w. of Coblenz. The river is here crossed by a bridge of 8 arches, 730 ft. long, and 25 broad. Trèves is a decayed place, and covers an area large in proportion to its population, owing to the number and size of the open spaces where houses once stood. The cathedral of St. Peter and St. Helen is a very interesting structure of various antiquity, principally of the early German Romanesque style of the 11th c., but retaining considerable remains in the

interior of a previously existing Roman church of the age of Constantine. It has beautiful altars and tombs; rich old chasubles and missals; famous relics, among others the "holy coat" (q. v.). Adjoining the cathedral is the *Liebfrauen-kirche*, a very graceful specimen of early German Gothic architecture, finished in 1243. The only other ecclesiastical buildings of interest now remaining, are the chapel of the Benedictine convent of St. Mathias outside the town, and the church of the Jesuits. Trèves contains some beautiful old dwelling-houses of Romanesque architecture. No place in Germany is so rich in remains of the Roman period. Among these are the *Porta Nigra*, a colossal gateway, probably one of the five gates by which Trèves was entered in Constantine's time, the so-called Roman baths (more probably part of an imperial palace), and a basilica built of Roman brick by Constantine for a court of justice, which, after being successively the residence of the Frankish kings and archbishops, was in a great measure demolished to make room for an electoral palace erected in 1614; this has recently been removed, and the basilica restored and fitted up as a Protestant church. Beyond the walls are the ruins of an amphitheater. The piers of the already-mentioned bridge, consisting of enormous blocks of lava, are also of the Roman period.

Trèves is the seat of a bishop, and of a provincial council, has a chamber of commerce, a priestly seminary, gymnasium, a library of 100,000 vols. and numerous MSS., a museum full of valuable antiquities—including the famous *Codex Aureus*, or MS. of the Gospels in gold letters, presented to the abbey of St. Maximin by Ada, sister of Charlemagne—and various benevolent institutions; and it carries on manufactures of woollens, cottons, and linens, besides a trade in corn, timber, and Moselle wines.

Trèves derives its name from the *Treviri* or *Treveri*, a Gallic, or more probably, a Belgic people, who inhabited, in Cæsar's time, a large tract of country between the Meuse and the Rhine. Their capital, *Augusta Trevirorum*, probably became a Roman colony in the time of Augustus, and ultimately became the head-quarters of the Roman commanders on the Rhine, and a frequent residence of the emperors, particularly of Constantine. Under the Franks, into whose hands it fell 463 A.D., it continued to flourish. In 843 it passed to Lorraine; in 870, to Germany; in 895, back to Lorraine; and finally was united to Germany by the emperor Henry I. The archbishop of Trèves was, in virtue of his office of chancellor of Burgundy, one of the electors of the empire, a right which seems to have originated in the 12th or 13th c., and continued till the French revolution. The ambition and talents of some of these episcopal rulers obtained for them great political weight in Germany. Since 1814 Trèves has belonged to Prussia.—See Haupt, *Treves's Vergangenheit und Gegenwart* (2 vols. Trier, 1822); Steiniger, *Geschichte der Trevirer unter der Herrschaft der Römer* (Trier, 1845); and Braun, *Treue und seine Alterthümer* (Trier, 1854).

TREVISIO, a compartimento in Italy, adjoining Belluno, Friuli, Vicenza, Padua, and Venice; 960 sq. m.; pop. '92, 403,519. The surface is in most part an exceedingly fertile plain, that part only which lies n. of the town of Treviso being hilly. The province is drained by the Piave and Livenza rivers; silk, wool, wine, fruit, corn, and cattle are the staples; paper is manufactured. Besides Treviso, the capital, Asolo, Oderzo, Castilfranco, and Ceneda are the chief towns.

TREVI'SO, a t. of Italy, capital of the province of the same name, on the river Sile, in a very fertile country, 18 m. n.w. of Venice. It is the seat of a bishop, and has a handsome and but recently finished Duomo, with five cupolas, and having an altarpiece of the annunciation by Titian; and among the other buildings are the old Gothic church of San Nicolo (with a number of excellent pictures), the public library, and a fine theater. The town is surrounded by a wall of from 24 to 38 ft. in height, and strengthened by numerous bastions. Manufactures of hardware are carried on; there are also a sugar refinery, a bell-foundry, and a number of paper-mills. Pop. of town, '95, commune, 35,500.

TREVITHICK, RICHARD, 1771-1833; b. England; an engineer in the Cornwall mines. He made various improvements in steam engines, and introduced high-pressure steam in place of the condensing action. In 1804 a locomotive of his construction drew 10 tons at a rate of 5 m. per hour. His engine exploded, however, and no practical application of the invention was made. He afterward made many inventions and improvements in machinery, such as floating docks, a hydraulic-engine, and warming apparatus.

TREVOR, Sir JOHN, Knight, b. in 1633. In the parliament of James II. which met on May 19, 1685, he was elected speaker of the house of commons. "Trevor," says Macaulay, "had been bred half a pettifogger, and half a gambler, had brought to political life sentiments and principles worthy of both his callings, had become a parasite of the chief justice" (Jeffreys), "and could on occasion imitate not unsuccessfully the vituperative style of his patron. The minion of Jeffreys was, as might have been expected, preferred by James, was proposed by Middleton, and was chosen without opposition."—*History of England*, vol. i. p. 508 (ed. 1849). In the same year, he was made master of the rolls. He contrived to maintain his political and judicial position after the revolution of 1688, and was again elected speaker on the meeting of parliament on Mar. 20, 1690, on an understanding with the government that he was to take the management of what may fairly be called the bribery department. At the same time, he

acted as first commissioner of the court of chancery, in which position his integrity seems from the first to have been greatly suspected; and though he was deficient neither in learning nor in parts, his judgments were both long in being given, and contemptible when they were pronounced. For some years, he maintained both his power and position; but his greed and venality at length became so notorious that respectable gentlemen of all shades of political opinion were ashamed to see him in the chair. In March 1695, a committee of the house of commons was appointed to investigate into the truth of certain charges of bribery brought against their speaker. Within a week, the committee reported, that in the preceding session, sir John Trevor had received 1000 guineas from the city of London for expediting a local bill. As soon as the report had been read in the house, it was moved that the speaker had been guilty of a high crime and misdemeanor. He had himself to stand up and put the question. There was a loud cry of "aye." He called on the "noes." Scarcely a voice was heard. He was forced to declare that the "ayes" had it. Even his "callous heart and brazen forehead" were unable to stand the unspeakable ignominy of his position. Had he returned to the house on the following day, he would have had to put the question on a motion for his own expulsion; he pleaded illness, and shut himself up in his bedroom. A few days afterward, he was formally expelled. He still, however, retained the mastership of the rolls, "to the great encouragement," says North, "of prudent bribery forever after." "His profligacy and inscience united," says Macaulay, "had been too much even for the angelic temper of Tillotson, who had been heard to mutter something about a knave as the speaker passed him." There are anecdotes of him in Noble's continuation of Granger's *Biographical History*, vol. i. p. 172. He died May 20, 1717, and was buried in the Rolls' chapel.

TRIAD, HINDU. See TRIMŪRTI.

TRIADS (in chemistry). Until recently, the terms *equivalent number* and *atomic weight* were usually regarded by chemists as synonymous. Many recent writers, among whom Laurent (see his *Chemical Method*, translated by the Cavendish society) stands pre-eminent, have, however, shown that there is an essential difference between them; and this difference is fully recognized by prof. Miller, who, in the latest edition of his *Chemical Physics*, 1863, thus defines it: "The equivalent or combining proportion is an experimental constant which is independent of theoretical considerations; but the relative atomic weight is necessarily a matter of inference, and may be a number, often a multiple of the equivalent, and selected by the chemist from theoretical considerations, which, being based partly upon the law of gaseous volumes, partly on chemical grounds, partly on the phenomena of specific heat, seem to require that the atomic weights of a large number of the elements, if compared with the atomic weight of hydrogen, should be double of those commonly given.—P. 22. Most chemists of the modern school now agree in arranging the elementary bodies in four groups; namely, 1. *Monad* or *unequivalent* elements (or *monads*), one atom of which in combination is equivalent to H_1 , or one atom of hydrogen. In these, the atomic and equivalent numbers are identical. They are twelve in number, and include hydrogen, chlorine, bromine, iodine, silver, etc. 2. *Dyad* or *biequivalent* elements (or *dyads*), each atom of which, in combining with other bodies, is equivalent to H_2 , or two atoms of hydrogen. In these, the atomic number is double the equivalent number. This group embraces 25 elements, including oxygen, sulphur, selenium, iron, zinc, etc. 3. *Triad* or *terequivalent* elements (or *triads*), each atom of which, in combining with other bodies, is equivalent to H_3 , or three atoms of hydrogen. In this group, which embraces nine elements, including nitrogen, phosphorus, arsenic, etc., the atomic and equivalent numbers are regarded as identical, except in the case of aluminium and rhodium, when the atomic number is doubled. 4. *Tetrad* or *quadrequivalent* elements (*tetrads*), each of which, in combining with other bodies, represents H_4 , or four atoms of hydrogen. Their atomic number is double the equivalent number. They are eight in number, including carbon, silicon, tin, etc.

This arrangement of the chemical elements, which is being adopted in all the most recent text-books, has led to the insertion of what are termed *dashed symbols*, in which the number of dashes which are attached to the symbol for the atom of an element indicates its equivalency or interchangeable value for hydrogen. Thus, Ag is marked with a single dash, to show that silver is a monad, or, in other words, that the atom of silver may be substituted for an atom of hydrogen, so as to combine with an atom of chlorine, the resulting compound being $Ag^{\prime}Cl$ (chloride of silver); Cu is marked with two, Bi with three, and Si with four dashes, to indicate that they are dyads, triads, and tetrads respectively, or that the atoms of copper, bismuth, and silicon may be substituted for two, three, and four atoms respectively of hydrogen, so as to combine with two, three, and four atoms of chlorine, forming $Cu^{\prime\prime}Cl_2$ (chloride of copper), $Bi^{\prime\prime\prime}Cl_3$ (chloride of bismuth), and $Si^{\prime\prime\prime\prime}Cl_4$, or $Si^{\prime}Cl_4$ (chloride of silicon). These dashed symbols are rapidly coming into general use.

TRIAL, as a legal term, applies most frequently to trial by jury (q.v.), whether in a civil or criminal matter. See PROSECUTOR.

TRIAL AT BAR is a jury trial which takes place before the full court of four judges, instead of one judge only. It is seldom resorted to, and leave must be given in each case on special grounds.

TRIANGLE (*tres*, three, *angulus*, a corner), the most simple of geometrical figures, is a figure having three angles; but, oddly enough, it is generally defined by geometers as a figure of three sides, and its property of being three-angled is put in the subordinate position of a necessary consequence. It may be that this arises from Euclid's use of the word *tripleuron* (three-sided) in the definitions prefixed to his *Elements*; while *trigōnon* (three-angled) is employed in the work itself.

In plane geometry, a triangle is bounded by three straight lines; and triangles are classed according to the relative length of their sides, into *equilateral* or equal-sided; *isosceles*, or having two sides equal; and *scalene*, or unequal-sided, the equality or inequality of the sides carrying with it the equality or similar inequality (of *greater* or *less*) of the angles respectively opposite to these sides, though the *ratio* of inequality of the sides by no means corresponds to that of the angles. Considered with reference to the size of its angles, a triangle is *right-angled* when one of its angles is a right angle (90°); *obtuse-angled*, when it has one angle greater than a right angle; and *acute-angled* when it has no angle so great as a right angle; the well-known property, that the sum of the angles of a triangle is equal to two right angles, preventing the possibility of more than one of them being as great as a right angle. For the relations between the sides and angles of a triangle, see **TRIGONOMETRY**. The triangle being the fundamental figure of plane geometry, through which the properties of all other figures have been arrived at, the investigation of its properties has always been held to be of primary importance. Of the immense number of results obtained by investigation, we can notice only two or three in this place. The lines joining the angles of a triangle with the points of bisection of the opposite sides, intersect at the same point, as also do the perpendiculars from the angles on the opposite sides, the lines bisecting the angles, and the perpendiculars from the middle points of the sides. The point of intersection of the first series of lines is the center of gravity of the triangle; those of the third and fourth series are the centers of two circles, the former of which touches the sides internally, and the latter passes through its three angular points. Another remarkable property of triangles, known as Napoleon's problem, is as follows: if on any triangle three equilateral triangles be described, and the centers of gravity of these three be joined, the triangle thus formed is equilateral, and has its center of gravity coincident with that of the original triangle. See also **TRIGONOMETRY** and **HYPOTHENUSE**. The area of a triangle is half of that of a parallelogram which has the same base and altitude, and is thus equal to half the product of the base into the altitude; it may also be expressed by the formula

$\sqrt{S(S-a)(S-b)(S-c)}$, where a, b, c , are the lengths of the sides, and S is half their sum.

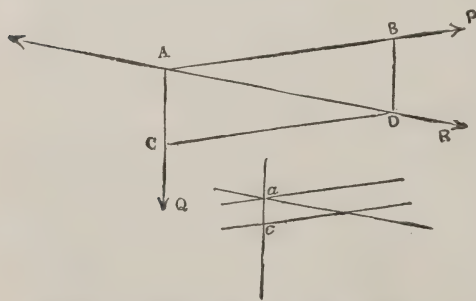
In the geometry of the sphere, a triangle is a figure bounded by three arcs of circles.

TRIANGLE, a steel rod bent into a three-sided figure open at one angle. It is hung by a string at the upper angle, and attached to the performer's left hand, to his desk, or to his drums. It is frequently used in the orchestra. Beethoven has a few strokes in his Ninth Symphony, and modern composers frequently use it in marches, dances, fantasias, etc.

TRIANGLE OF FORCES, in mechanics, is the name given to a proposition which is merely a formal modification of the *parallelogram of forces* (see **COMPOSITION OF FORCES**), and, as generally stated, is its converse. The parallelogram of forces enunciates that, if two forces, P and Q (fig.)—represented in direction and magnitude

by AB and AC —inclined at an angle to each other, act on a point A , their resultant, R , is represented in direction and magnitude by the diagonal, AD , of the parallelogram formed on the two lines AB and AC . Now, as the resultant, R , is equivalent to the combined action of P and Q , it would exactly counter-balance them if acting in the opposite direction AR , but would still be fully represented by the diagonal line AD , taken as from D to A . Also, instead of AB , CD may be taken to represent P . Hence as the sides of the triangle ACD completely represent the three forces, we have the proposition, that if three

forces in the same plane be in equilibrium on a particle, and if in that plane any three mutually intersecting lines be drawn parallel to the directions of the forces, the lengths of the sides of the triangle thus formed will be proportional to the magnitudes of the forces. Its proof rests upon the previously ascertained fact that R, P , and Q , three equilibrating forces at A , are proportional to AD, CD, AC , and on the geometrical theorem that a triangle whose sides are respectively parallel to those of another triangle, has its sides proportional to those of the latter; and consequently, the ratio and relative direction of the forces R, P , and Q are fully represented by ad, cd , and ac , the sides of the triangle



acd. Again, as the sides of a triangle are to one another as the sines of the opposite angles, so also are the forces which the sides represent. Hence

$$P : Q : R' :: CD : AC : AD :: \sin. CAD : \sin. ADC : \sin. ACD$$

(and substituting the sines of the supplementary angles)

$$:: \sin. QAR' : \sin. PAR' : \sin. PAQ;$$

that is, each force is proportional to the sine of the angle between the directions of the other two.

TRIANGULAR NUMBERS. See FIGURATE NUMBERS.

TRIANGULATION is the operation of dividing any portion of the earth's surface into triangles of as large a size as possible, which may be called primary, and which must be afterward subdivided into triangles of a smaller size, forming a great network of secondary or subsidiary triangles, which serve as a means of working down from great to less, and finally completing, by a system of scientific checks, an accurate map or delineation of the region covered by such triangles, forming the geodesical process called a trigonometrical survey. See ROY, WILLIAM; TRIGONOMETRICAL SURVEY. The same operation is used in the measurement of an arc of the meridian, for the purpose of ascertaining the length of a degree of latitude or longitude on any part of the earth's surface; but in this case, only primary triangles are necessary, as no topographical detail is required, and the positions of the apexes of the triangles are astronomically fixed in the most careful manner, which is not always done in the triangles of a trigonometrical survey.

In carrying out a system of triangulation, much judgment and an accurate local knowledge of a country are necessary; and it very often happens that a more extensive range of angles can be obtained from a comparatively low station than from the tops of the highest mountains. The angles of each triangle should be as near equal as possible, and, unless local circumstances render it unavoidable, very acute or obtuse angles should not be used. The sides of the primary triangles should be as long as can be conveniently observed, but in practice they vary from 80 * m. or more to 4 m., or even less. The angles are generally determined by a large theodolite, of as simple and strong a construction as possible, which is fixed on the most elevated points of mountain ranges, etc. When the apexes of the triangles are very distant, heliostats, or mirrors reflecting the sun's rays, are often used, and in dark or cloudy weather the Drummond light has been employed. The primary triangles being fixed on the spherical surface of the earth, certain formulæ, according to the rules of spherical trigonometry, must be applied to reduce them to the simple calculations for ascertaining, from certain known data, the sides and angles of plain triangles. The whole of those calculations are dependent on the accurate measurement of a base or fundamental line. The instruments invented by Capt. Drummond, R.E., with which he measured the base-line of the Irish survey at Lough Foyle, and which were afterward employed by sir T. Maclear in verifying Lacaille's base-line on the plains of Malmesbury, in the Cape triangulation, appear to have been as nearly perfect as possible. The length of base-lines used in modern surveys varies from 3 to 7 m.; Gen. Roy's original base-line of the English survey was 5.19 miles.

At the end of a large triangulation, a second or testing base-line is always measured at a distance from the original one; if the measured length of this agrees with that ascertained by calculation, it may be considered a proof of the accuracy of the work in general.

The triangles of the English survey have been extended to and connected with those of France, Russia, etc., as far e. as Siberia, and s. to Algeria; and it is not at all improbable that the triangles of the Russian survey will eventually be connected at one side with those of the great survey of India, which already has the apexes of many of its triangles on the summits of the Thibetan Himalaya, and to the eastward across Behring's strait, with those of British America and the United States.

TRIAS, the oldest group of the secondary strata, formerly associated with the permian rocks under the name of the new red sandstone (q.v.). The term trias, or the triple group, has been given to these beds by German geologists because they are separable into three distinct formations: the Keuper, Muschelkalk, and Bunter-sandstein; and the name has been generally adopted, as the beds are more fully developed in Germany than in England or France. The German beds have consequently been accepted as the types of the group, and the deposits in Britain and elsewhere are co-related with them.

The typical beds are divided into—1. Keuper (q.v.), with a maximum thickness of 1000 ft.; 2. Muschelkalk (q.v.), with a maximum thickness of 600 ft.; 3. Bunter-sandstein (q.v.), with a maximum thickness of 1500 feet.

In England the principal triassic deposit occurs in a great basin of the paleozoic strata in Lancashire, Cheshire, Shropshire, Staffordshire, and Leicestershire. The eastern base of the great central Pennine range of hills is composed of triassic beds, which, beginning in Leicestershire, run northward through Nottingham and York to the coast of Durham. From Staffordshire another series of these beds may be traced along the valley of the Severn, and crossing the Bristol channel, through Somerset and Devon, to the southern coast.

*In the survey of India, and also in the process of connecting the triangulation of Ireland with that of Great Britain, many of the sides of the triangles greatly exceeded this length.

TRIBE (Lat. *tribus*, a division, originally perhaps a third part, in reference to the three cantons whose coalescence formed the germ of Rome, q.v.), an aggregate of stocks—a stock being an aggregate of persons considered to be kindred—or an aggregate of families, forming a community usually under the government of a chief. The chief is possessed of despotic power over the members of the tribe. It is commonly said that he has “patriarchal” power—such power, that is, as fathers in early times exercised over their children. The tribe has been the earliest form of the community among all the races of men.

In a very large proportion of existing tribes the tribe is an aggregate of several stocks or distinct bodies of kindred. The persons of whom the tribe consists are included in stocks which are, or are accounted, distinct from each other. This organization is sustained by two tribal customs—(1) persons of the same stock are forbidden to intermarry; and (2) kinship is reckoned through females only, so that children are accounted of the stock of their mother. Persons of the same stock, too, owe duties to each other, and are to some extent sharers in each other's liabilities. Thus, an injury done by a man is an injury done by his stock, which may be avenged upon any member of it; an injury done to a man is an injury done to his stock, for which every member of it is bound to seek vengeance. In consequence of the customs above mentioned, a husband must be of a different stock from his wife or wives; he must therefore be accounted of a different stock from his children; and when he has wives of different stocks, their respective children are accounted of different stocks. More than one stock is thus represented in every household; and since a man owes duties to his stock—the duties of acknowledged blood-relationship—while to those of his family who are not of his stock, nothing but the accident of birth (only accident) unites him, the family among these tribes has necessarily little cohesion. The tribal customs which have been referred to ignore the family altogether; they are founded upon the idea of stock. They are the customs of people with whom the conception of stock was a powerful social influence, when that of the family was impotent—of people who must have been divided into stocks at a time when, possibly, they had no family system. It is inconceivable that such customs should have arisen in the face of a family system anything like that which prevails among civilized peoples, or even of such an approach to the family as many of those tribes now possess. And it follows that the family has *grown* among these tribes. It is obviously now growing among them. Now, in many cases, the only obstacle to its rapid development is the firm hold which the idea of stock has taken of the tribal life. On the other hand, the prevalence of customs founded upon the idea of stock proves a prior existence of stocks, or bodies of kindred. The separation into stocks must be older than the customs, at least as customs associated with the idea of stock. And keeping this in view, and considering how difficult it is to conceive of several stocks herding together at the early time when every stranger was an enemy, unless there was some natural connection between them—such a connection as the marriage-law and the system of kinship, when they arose, would establish—it may safely be concluded that each stock was originally a separate tribe. Into the tribe conceived of as a single stock the marriage-law and system of kinship would gradually bring a variety of neighboring stocks; and thus the tribe would become what it is—an aggregate of stocks. The progress of such tribes appears to have been from the tribe conceived of as a group of kindred to the tribe consisting of several stocks or groups of kindred; and now, though the family is not yet fully developed among them, they seem to be tending to become aggregates of families. The tribes of Australasia are the most perfect examples of the organization above described; but it also exists (or it existed) among the tribes of North, and most of those of South America, among a majority of the known tribes of Africa, and a large proportion of the ruder tribes of Asia.

Suppose male kinship (which must come with the growth of the family) introduced among tribes such as have been spoken of, containing different stocks. First, the stocks existing within the tribe would be fixed, stereotyped, within it; secondly, the growth of the family would be greatly promoted, and the influence of the idea of stock proportionately diminished. The family would in time rise to the importance originally possessed by the stock; and at length the tribe, still divided into stocks, would become, politically, an aggregate of families. The tribe would thus assume the exact shape which it had in the early ages of Greece and Italy, when it was an aggregate of families included in clans or bodies considered kindred (*gentes*); the exact shape which it now has among the most advanced of existing tribes. Since a tribe of the Australian type might thus develop into a tribe of the classical type, is it not probable that the latter really was the result of such a process of development? Regarded as a hypothesis, this view will be found to fulfill all the conditions of a good hypothesis. And if the circumstances of tribes which have what is popularly termed the marriage law of caste—among the greatest of which a division corresponding to the Roman *gens* prevails—can be reconciled with it, or with an extension of it, we shall have got a hypothesis capable of explaining the formation of tribes in general. The tribes above referred to, whether divided into clans or not, consider themselves of a common stock. They restrict marriage to the stock; but they always forbid marriage within certain degrees of relationship; and in numerous cases—among them, those of the most numerous caste peoples—they also forbid marriage within the clan or body considered peculiarly kindred. It will be convenient, for want of a

better word, to speak of this marriage law as caste. And by caste tribes, in what follows, are to be understood tribes which have this marriage law.

Seeing that the law forbidding marriage within the tribe, and the law restricting marriage to the tribe have both been widely prevalent among human races, both must be conventional, produced by circumstances; and if in their origin they are equally ancient, men, at the first, in respect of their circumstances, must long have been divided into two bodies very differently placed. This, however, is very improbable. There is no evidence for it; there is some evidence against it. The circumstances, too, capable of producing caste must have been isolating circumstances. The effect of an isolated position in producing an approach to caste may be seen in the case of the royal houses of Europe. Excepting, perhaps, mere physical isolation, it is difficult to conceive of isolating circumstances which could operate in the earliest times. Those which can be conceived of, and which are also known to have operated among caste peoples—the pride of conquerors, peculiarities of religion, the sentiment of an aristocracy or a priesthood, hereditary occupations—could only exist when society is somewhat advanced. It thus becomes highly probable that caste did not prevail in the earliest times—was not the original law of any tribes. There is strong corroboration of this in the fact, that it is found imperfectly established—in the course of being established—among not a few existing tribes; and in the fact, that it became the law of peoples—for example, the Hebrews—whose ancestors, according to tradition, followed a different practice. In connection with these considerations, there is conclusive reason for holding that caste was not an original law, in the law of incest which prevails among the greatest of caste peoples, by which marriage is forbidden, not only within certain degrees of relationship, but also within the clan or body of kindred denoted by a family name. The existence of any law of incest among a caste people requires explanation. But how could a prohibition of marriage within the clan arise among people, whose principle it was to marry within the kindred? This can only be referred to circumstances which preceded the origin of caste. Does it not, then, suggest the establishment, through the force of isolating circumstances, of caste—the restriction of marriage to the tribe, or to particular tribes—among tribes divided into stocks which had forbidden marriage within the stock? This would, at any rate, account for the facts. The original prohibition, upon this view, is still represented by the prohibition of marriage within the clan. But as tribes advanced, the family usurped the place of the stock; there sprung up a belief in the common origin of the tribe; and the law of succession to family property gave a new importance to near relationships. The law of incest would naturally tend to follow the practically important limits of relationships; and it might, being still applicable to the stock, be held specially binding within those limits; or it might be confined to them, for in the case of small and simply-constituted bodies, within which the differences of condition and of employment were few and slight, the stocks—pressed, on the one hand, by the growth of the family, on the other, by the growing belief in the common descent of the tribe—would be apt to disappear altogether. The absence of the stock or clan in the case of some of the smaller caste tribes, and the two laws of incest found among caste peoples—one of which, at least, seems otherwise inexplicable—can thus be accounted for consistently with the hypothesis of such peoples having progressed from the organization of the Australian tribe. And it having been shown that caste is not an original law, all other circumstances of caste tribes will be found consistent with that hypothesis. The belief which many tribes have had in their descent from one progenitor, is not corroborated in any case. It cannot prove its own truth. In many cases it can be shown to be a fiction; it is presumably so in all cases, and it does not afford an argument for or against any theory of the origin of tribes.

The hypothesis of development, as it may be called, is thus capable of connecting together all the varieties of the tribe, the simplest with the most advanced; and it gives us, as the earliest and simplest idea formed of the tribe, that it was a body of persons who conceived themselves to be of a common stock. It is in the favor of this hypothesis that it affords an easy and natural explanation of the peaceable political union and fusion into one people of neighboring tribes; and of the fact, that a population is divided into a greater or less number of tribes, according as it is less or more advanced. Neighboring tribes would contain the same stocks; they would thus be really homogeneous, and related; they would be ready for union as soon as their circumstances brought them into close contact, and made a political union desirable.

There are facts and arguments by which this hypothesis may be raised to so high a degree of probability, that its soundness can scarcely be doubted. A single example of them must suffice. It is the received opinion that among the advanced tribes containing gentes, property was originally vested in the gens, and was only by slow degrees wrested from it by the family. It is involved in this, that at one time the gens was everything, the family nothing, in the organization of the tribe; that the latter grew, and that as it grew, the former sunk in importance. The tribe, when property was exclusively vested in its gentes, must have been an aggregate of gentes, not an aggregate of families. All this is consistent with, and corroboratory of the hypothesis of development; in particular, it strongly corroborates the view that the tribe at an early period consisted of several bodies of kindred, accounted distinct from each other, and

sach of which held property in common. It has never been accounted for upon any other view.

The only other theory which has been formed of the origin of tribes—commonly called the patriarchal theory—is that a tribe consists in the main of the descendants of a single family, descent being chiefly, if not exclusively, reckoned through males; and that the gentes found within the tribe consist of the descendants of individual sons or grandsons of the common progenitor. It is evident that this theory does not explain the organization of the numerous class of tribes first considered. It has been formed upon observation of the advanced tribes of the classical type, but it does not consist with the history of property (to test it at a single, but a vital point) even among them. It might account for property being vested in the tribe; it does not account for it being vested in the gentes. It can only do so by the aid of the assumption that, though the sons and grandsons of the original progenitor had the desire for family property, and divided his property, or accumulated property of their own, their descendants suddenly lost that desire, and began to hold in common. But such a supposition is too improbable to be entertained. This theory is also excluded in the case of all polyandrous peoples, for it assumes that society began with monandric marriage, a perfect idea of the family and male kinship—all conditions the very opposite of those which must at one time have prevailed among such peoples. And polyandry can be shown to have prevailed so widely, that it is probable it has been the earliest practice of every human tribe. However this may be, a theory which is contradicted by a great proportion—much the greatest number—of the cases to be accounted for, and is in important respects not consistent with any class of cases, cannot be a good hypothesis; and therefore the patriarchal theory has no title to be accepted as explaining the normal history of the formation of tribes, or of any class of tribes. Its fundamental assumption, indeed—the segregation of individuals who became progenitors of tribes—seems to be at variance with the nature of man, which all experience has shown to be social and gregarious, and to be the most averse to separate and independent action, when society is the least advanced. It should also be stated that it fails to do what a sound theory of tribal formation must do—to account for the fusion of neighboring tribes, independently of conquest, into one people. To account for this, it has been customary to suppose that neighboring tribes, wishing to unite, adopted one another; but there is no evidence of such adoption having ever been practiced, and the supposition seems entirely improbable.

The patriarchal theory was, until recently, the received account of the formation of tribes. The theory which has here been styled the hypothesis of development was first propounded, though without elaboration, in a work published in 1865, *Primitive Marriage*, by J. F. McLennan. See also Reclus, *Primitive Folk* (1891)

TRIBONIANUS, a very eminent Roman jurist of the 6th c., of Macedonian parentage, but b. in Pamphylia. He held, under the emperor Justinian, the offices of quæstor, master of the imperial household, and consul. But he is famous chiefly through his labors in connection with the code (q.v.) of Justinian (q.v.) and the pandects (q.v.). Tribonianus died in 545.

TRIBUNE. See **ROME**.

TRICHECUS. See **MORSE**.

TRICHI'ASIS (Gr. *thrix*, gen. *trichos*, of a hair) consists in a growing inward of the eyelashes; three or four of them (sometimes only one) presenting their points toward the globe of the eye, while all the other hairs retain their natural position. The disease is exceedingly common among the lower classes, and especially the Irish. This affection causes great annoyance, by exciting a pricking sensation, and by the constantly irritable and watery state of the eye which it induces. The treatment consists in plucking out the offending hairs (if they are few in number) from time to time, each hair being removed by hair-forceps with a slow steady pull. If they form a little group, they must be removed by dissecting out the small portion of lid in which they are implanted, and uniting the wound with a suture. In other cases, it may be necessary to remove the entire margin of the lid.

TRICHI NA SPIRA LIS, the name given to a peculiar nematoid worm, which, in its sexually immature state, inhabits the muscles usually of the pig. It was discovered in 1835, Mr. Wormald, then demonstrator of anatomy at St. Bartholomew's, giving to Prof. Owen four microscopical specimens of speckled muscle from a subject that was then in the dissecting-rooms; and Mr. Paget, then a first year's student, simultaneously investigated the question. Prof. Owen, to whom the discovery of the trichina is generally referred, soon afterward communicated to the zoological society his "Description of a Microscopic Entozoon infesting the Muscles of the Human Body," in which he describes the speckles as capsules containing a spirally-coiled microscopic worm, to which he gave the generic name trichina (Gr. *thrix*, a hair), and the specific name *spiralis*, from its coiled arrangement. Mr. Paget had independently arrived at similar results, with the aid of Robert Brown of the British Museum, and read a paper on the subject to the Abernethian society a week before Prof. Owen's memoir was read to the zoological society; so that his name should always be at least associated with that of Owen, in reference to

the discovery of this worm. From the date of this discovery to the present time, the *trichina* has been a fertile source of discussion. In 1845 the idea was mooted by various naturalists that the trichina was the undeveloped or sexless form of some other worm; and in 1855 (after the transformation of the cysticercus into the tapeworm was discovered), various suggestions were made on this subject; but it was not till 1860 that Virchow and Leuckart, by feeding animals on flesh containing trichinae, arrived independently at the correct conclusion, that the parents of the encysted trichinae are small nematoid worms, which had never previously been described, Leuckart's experiments being made with human flesh containing these parasites.

The young trichinae, as they are seen in the human muscles, present the form of spirally-coiled worms, in the interior of small, globular, oval, or lemon-shaped cysts, which appear as minute specks scarcely visible to the naked eye. These cysts are more or less covered externally with calcareous matter, according to the length of time they have remained in a fixed position, and the degree of degeneration which their walls have undergone. The trichina measures, according to Cobbold, on an average $\frac{1}{8}$ of an in. in length, and $\frac{1}{16}$ of an in. in breadth. The cysts are sometimes altogether absent, and hence they must be regarded as abnormal formations, resulting from local inflammation set up by the presence of the worm, which in this larval condition of existence measures $\frac{1}{16}$ of an in. in length, and $\frac{1}{32}$ of an in. in breadth. These larval worms exhibit a well-marked digestive apparatus, and afford evidence of the presence of reproductive organs, which are often sufficiently developed to enable the observer to determine the sex of the organism. The number of larval trichinae that may simultaneously exist in the muscles of a single man or animal is enormous. In a cat on which Leuckart experimented, a single ounce of flesh was estimated to contain 325,000 trichinae; and if all the voluntary muscles of a human body of ordinary size were similarly affected, the number of worms would exceed 1950 millions. Dr. Cobbold believes that there can be no doubt that the number in a single "bearer" (as he terms the sufferer) may *actually* amount to at least 20,000,000.

We now proceed to the consideration of the mature worms. When an animal is fed with flesh containing the larval worm already described and is killed a few days afterward, a large number of minute worms are found mixed with the contents of the small intestines. On closer examination, they are found to be of two kinds—the larger and more numerous ones being the females, and the smaller and rarer ones the males. At the second day after their introduction, these intestinal trichinae attain their full sexual maturity; and in six days the females contain perfectly developed and free embryos in their interior.

The female is a slender round worm, varying in length from $\frac{1}{12}$ to $\frac{1}{8}$ of an inch. The anterior end presents a bead-like appearance, from which the intestinal canal proceeds. The posterior three-fourths are mainly occupied by the reproductive organ, which is filled partly with free embryos, and partly with eggs in various stages of maturity. When these embryos have attained their full size within the uterus of the parent, they pass out at the genital aperture, and commence life on their own account. They are little worms with rounded ends, and presenting no indications of any internal organs. Before entering into the history of their migrations, we may mention that the male worm is seldom more than two-thirds the length of the female. It presents the same bead-like arrangements as the female, and a reproductive organ whose aperture apparently coincides with the anus; while the female sexual aperture is comparatively near the head-end of the worm. The body terminates with two hooks which are doubtless subsidiary to the reproductive process. The males are less numerous and shorter lived than the females, and probably die after having discharged their natural function. The females continue bringing forth young for a period of two or three weeks. The embryos, according to Leuckart, Cobbold, and all our best helminthologists, penetrate the walls of the intestine, and pass directly into the muscles of their "bearers" or "hosts," where, if the conditions are otherwise favorable, they are developed into the form originally observed by Owen and Paget. In this way, by proceeding along the course of the intermuscular connective tissue, some of them reach the muscles of the extremities and other distant parts; but the majority of the wandering embryos (according to Virchow) "remain in those sheathed muscular groups which are nearest to the cavity of the body (abdomen and thorax), especially in those which are smaller and most supplied with connective tissue." These embryos penetrate into the interior of the separate muscular bundles, and in the course of 14 days acquire the size and organization of *trichina spiralis*. The surrounding tissues soon become disorganized, and the spot inhabited by the coiled-up worm is converted into a spindle-shaped widening, within which the previously described cyst is formed by a hardening and calcification of the exterior. A point of great importance in relation to the distribution of this parasite, and as having a practical bearing upon the disease known as *trichiniasis* (q.v.), has been established by the experiments of Davaine—viz., that while in the adult condition, trichinae perish in cold water in about an hour, and cannot survive the decease of their host for more than six hours, the larvæ remain alive in water for a month, and will live for a long time in flesh which has become putrid. In this way, "a carcass near a marsh or rivulet may communicate the parasites to the ruminants that drink the water, or to pigs."

In the same year (1860) in which Virchow and Leuckart proved that by feeding an

animal on flesh containing the *trichina spiralis*, intestinal trichinæ were produced, and watched the transformation of the young of the latter into muscular trichinæ, a very important corroborative medical case was observed and recorded by Zenker. In this case the patient was a servant-girl, aged 20, and the principal symptoms were loss of appetite, prostration, violent pains, and contraction of the limbs; and finally œdema, which, with a certain amount of phneumonia, terminated fatally in the course of a month. After death, numerous larval trichinæ were found in her muscles, while the intestinal canal contained sexually mature worms. Three weeks previously, before the girl had taken ill, she had assisted in killing pigs and making sausages. It was further ascertained that a few days before her illness commenced she had eaten some of the meat in a raw state. On examination it was found that the pork (both hams and sausages) contained numerous encysted trichinæ. It was, moreover, ascertained that the butcher and several members of the girl's family (to whom she had probably given sausages) were attacked with symptoms similar to those which, in her case, proved fatal. How the pig acquires its trichinæ is unknown; but that the larval trichinæ contained in putrid flesh, etc., may easily gain admittance to the pig's alimentary tract is a supposition at once feasible and of likely kind. Beet-root, earth-worms, moles, and rats have been suggested as their infectors; but on this subject see the advice given by the French commissioners in the next article. The adult trichina is liable to infest the intestinal canal of all animals in which the larvæ have been found in the muscles. In this category must be placed man, the dog, cat, rabbit, rat, mouse, mole, hedge-hog, and badger. Whether birds ever contain trichinæ is doubtful, and reptiles and fishes are quite free from this parasite. See illus., **WORMS, ETC.**, vol. XV.

TRICHINIASIS is the name of the diseased condition which is induced by the ingestion of food containing *trichina spiralis* in large quantity. The first recorded case, as occurring in the human subject, is that of Zenker, which has been already noticed in the article **TRICHINA**; but there can be no doubt that the disease has long existed, although its origin was previously unsuspected. The first symptoms of this disease, as it occurs in the human subject, are loss of appetite, followed by nausea and a sense of fatigue, prostration, and general indisposition. This stage lasts about a week. Pain and stiffness of the limbs, accompanied by swelling of the face, and fever of a peculiar type, characterized by a very frequent pulse, moderate thirst, and copious perspirations, now show themselves; the commencement of the second stage of the disease being thus synchronous with the migration of the trichina-brood into the muscles, there to become encysted. During this stage, pressure, or any attempt to move the parts under the control of the swollen muscles, is intensely painful, and even the normal respiratory movements cause such constant pain as to render sleep impossible. In severe cases the patient lies on his back like a paralyzed person. The tongue presents much the same appearance as in ordinary gastric fever. The bowels are most commonly constipated, but in some of the worst cases there is continuous diarrhea. The swelling which began in the face now disappears, and is replaced by swelling of the feet, which gradually rises to the trunk. In about the fourth week of the disease the trichinæ may be regarded as permanently settled, and as having completed their destructive action on the muscles. This is the beginning of the third stage, which is mainly characterized by extreme weakness. The gastric symptoms abate, the appetite returns, and, in favorable cases, the muscular pains and swelling gradually diminish, while in severe cases, this third stage is the most dangerous part of the disease; the diarrhea being severe, and accompanied with tenesmus, and often with the involuntary discharges of the feces and urine, while the skin exhibits extreme pallor, and is enormously distended with effused serum. Moreover, pneumonia often supervenes at this period. The fourth and last stage is that of convalescence. This may begin at the fifth week, or later, and may last from 3 weeks to as many months. In mild cases it is impossible to draw a definite line between this and the preceding stage. Death may occur at any period. It has been observed as early as the 5th, and as late as the 42d day of the disease. A single trichinous pig, if its flesh is eaten without being previously submitted to such culinary processes as to destroy the vitality of the larval trichina, may establish a local epidemic of this disease. The most important of those epidemics have occurred in Germany, and are noticed by a German physician, Dr. Thudichum, in "The Seventh Report of the Medical Officer of the Privy Council," 1865. Of these, the second or great epidemic at Hettstädt was the most severe. It commenced in the second half of Oct., 1863, and affected 158 persons, of whom 28 died. All these persons were found to have been eating trichinous pork, either perfectly raw, or in the form of smoked or fried sausage, meat-balls, brawn, black-pudding, etc.

As soon as a case of suspected trichiniasis comes under the notice of the physician, attempts should be made to remove the mature worms from the intestine by active purgation. For this purpose calomel, in scruple doses, is more serviceable than any other purgative. Two or three such doses should be given at intervals of 24 hours. No special directions can be given for the treatment of the fever. If there is any appetite, the diet should be light, and at the same time nourishing. Liebig's extract of meat has been found very serviceable in keeping up the strength. The most effectual remedy for the sleeplessness was found to be the cold wet sheet, in which the patient should be wrapped

repeatedly during the day. The preparations of opium only aggravate the discomfort. The other symptoms must be treated by the ordinary rules of therapeutics.

Considering the gravity of this disease, it would be of the greatest importance to be able to decide, during its life, whether a pig were trichinous or not. On this point there is some difference of opinion; but Profs. Delpech and Reynal, who were charged by the French government to report upon this disease, assert that "the animal, while living, shows no signs of the presence of trichinæ, nor can they be detected in the meat with an ordinary lens, but a powerful microscope renders them at once visible." In Hanover, out of 25,000 pigs, 11 were found trichinous; in Brunswick 16 were affected out of 14,000, while in Blakenburg 4 were diseased out of 700. The French commissioners assert that a temperature of 167° Fahr. is sufficient to kill the parasites, and that meat thoroughly salted is also perfectly safe; they advise that smoke-dried sausages, though probably safe, should be well boiled. They further attribute the spread of the disease among pigs to the fact that they are foul feeders, and will eat any offal, such as the dead bodies of rats and other animals, which are known to be liable to the disease. They recommend farmers to be very cautious in feeding their pigs to avoid giving them flesh without first boiling it; to destroy rats and small carnivorous animals, and never to leave human or other excrements in places where pigs can reach them. Finally, they advise all experimenters to burn trichinous flesh when their investigation is completed, and not to throw it away, for a fragment of it might possibly be eaten by a rat, the rat devoured by a pig, and the pig thus become the medium of the disease to man. This utter destruction of the parasites is a point on which our countryman, Dr. Cobbold, has long insisted. In 1863 a trichinous pig from Valparaiso, killed on board a merchant-vessel on the high seas, caused the death of two of the crew; and in 1864 there was a slight trichinous epidemic at Cheektowaga, New York. Probably trichina-disease is a common ailment in this and other countries; its symptoms, save in very severe cases, attracting no special notice, from their similarity to those of rheumatic disease and acute febrile attacks. The disease has been known to occur in the n.w. of England in a mild form; but helminthology, and the detection of parasites of all kinds, requires still much cultivation at the hands of the medical profession. In 1835 Mr. Wood, of Bristol, published, in the *Medical Gazette*, a case of acute rheumatism accompanied by pneumonia, in which trichinæ were discovered after death; thus *all but* anticipating Zenker in discovering a new disease.

TRICHINOPOLY (more correctly **TRICHINAPALLI**), the capital of a district of British India of the same name, on the right bank of the Kaveri, 30 m. w. of Tanjur and 56 m. from the sea. The fort which includes the old town, stands on the rugged slope of a steep granite rock, 500 ft. in height, which from some points resembles Edinburgh castle. The walls of the fort, which are now demolished, had a circuit of 2 m., and this area is inhabited by a dense population, dwelling in low, closely packed huts. The streets are tolerably regular, and are crowded at all hours of the day with multitudes of passengers, bullock-carts, and cattle. Beyond the walls is St. John's church, containing the tomb of Bishop Heber, who was buried here in 1826. The climate during eight months of the year is exceedingly hot, nevertheless Trichinopoly is the headquarters of the south division of the Madras army; there are several barracks, and the lines for the men and the officers' houses cover a large space of ground. Cheroots are manufactured in large quantity, from excellent tobacco grown in the vicinity. Manufactures of hardware, cutlery, and jewelry, especially gold chains, harness, and saddlery, are extensively carried on. A railroad to Madras was opened in 1875. Pop. '91, 90,609. Area of district, 3561 sq. m. Pop. of district, '91, 1,373,000.

TRICHIURIDÆ, a family of acanthopterous fishes, related to the mackerels, but distinguished by their elongated form and imperfectly developed anal fin. The slender tail is sometimes filiform, but generally is terminated by a caudal fin; skin naked; head compressed, eyes lateral; mouth with deep lateral cleft; teeth in jaws and palate; branchial apertures large; branchiostegal rays in seven or eight pairs; dorsal fin long, generally single, but often divided into two parts; anal fin represented by numerous concealed spines; caudal fin forked or wanting; pectorals well developed; ventral fins rudimentary; vertebrae numerous. There are only a few genera, inhabiting deep seas, one of which is *lepidopus*. See **SCABBARD FISH**.

TRICHOCEPHALUS (derived from the Gr. *thrix*, gen. *trichos*, a hair, and *cephale*, the head), is the name given to a genus of intestinal worms, of which one species *T. dispar* (described by the older writers, who mistook its head for its tail, as *trichurus* and *ascaris trichiura*), infests the human intestinal canal. Dr. Cobbold describes it as a small nematoid worm, the male measuring $1\frac{1}{2}$ in., and the female fully 2 in. in length; it is characterized by an extremely long hair-like head and neck, occupying about two-thirds of the entire length of the body. This parasite is comparatively rare in this country, while, according to M. Davaine, not less than one-half the inhabitants of Paris are infested by it. Its presence is attended with little or no inconvenience. Its development and mode of gaining access into the body are subjects to which much attention has recently been paid, but which are by no means as yet cleared up. Davaine finds that the eggs are not developed within the host's intestines, but are discharged *per anum*, in the immature condition in which they escape from the parent; and it further appears, that after their expulsion, a period of six months must elapse before embryonic formation commences. As in the more common instance of *ascaris lumbricoides*, it is probable that they complete

their development in open water, from which they are transferred to the human stomach.

For further information on the genus *trichocephalus* generally, we may refer the reader to Part I., chap. v. of Dr. Cobbold's *Entozoa*; while the species considered in this article is fully discussed in Davaine's *Traité des Entozoaires*.

TRICHOPTERA. See CADDICE.

TRICK, a term used in heraldry to denote a mode of representing arms by sketching them in outline, and appending letters to express the tinctures, and sometimes numerals to indicate the repetition of changes.

TRICOLOR means literally no more than a flag in three colors, which is the case of almost every national ensign; but the applied sense limits it to flags having three colors in equal masses. The principal European tricolor ensigns are: France—blue, white, red, divided vertically. German empire—black, white, red, divided horizontally. Italy—green, white, red, divided vertically. Belgium—black, yellow, red, divided vertically. Holland—red, white, blue, divided horizontally. The tricolor took its rise at the commencement of the French revolution as the badge of the national guard. The red and blue were selected as the arms of Paris, and the white was added, as the color of the army, to show the intimate union which should subsist between the people and the armed force.

TRICOUPIS, CHARILAOS, Greek statesman, son of Spiridion Tricoupis (q. v.), born at Nauplia, July 23, 1832. After pursuing courses in law at Paris and Athens, in 1850 entered the diplomatic service as attaché to the legation at London, where in 1863 he became chargé d'affaires. Elected to the Boulé in 1865, he became an adherent of the radical party, was in 1867 minister of foreign affairs, premier during 1875-6, again minister of foreign affairs under Canaris, in the coalition ministry of 1877, and premier during 1882-85, 1886-90, and 1895, when owing to the financial embarrassment of the government, he met with a crushing defeat, losing even the seat in the Boulé, which he had held for thirty years. While on his death-bed he was re-elected by the district of Valtos. He died at Cannes, France, April 11, 1896.

TRICOUPIS, SPIRIDION, a modern Greek statesman and author, son of a primate of Missolonghi, was born in that town in 1788. After completing his studies in France and England, he went to the Ionian isles, where he aided lord Guilford in the foundation of the university of Corfu (1820); but on the outbreak of the war of independence in the following year, he hastened to enroll himself among the patriots, and played an important part in the great struggle. From 1821, except during the presidency of Capo d'Istria, he was continually employed in administrative and diplomatic business. During the reign of king Otho, he was thrice sent to London (1835-38, 1841-43, and 1850-55) as envoy-extraordinary; he was minister of foreign affairs and of public instruction (1843); vice president of the senate (1844-49); and envoy-extraordinary to Paris (1850) on the occasion of the blockade of the ports of Greece by England. In the grave political vicissitudes he had his share, and in 1862 declined to form a ministry on account of ill health. He died in 1873.

Tricoupis enjoyed a great reputation in his own country as an orator and historian. His funeral oration on lord Byron (whose friend and comrade he had been), delivered in the cathedral of Missolonghi, some days after the poet's death, has been translated into most European languages. Many other orations, partly religious and partly political, spoken by Tricoupis in the course of the revolution, have been collected and published (Paris, 1836). Besides these, we must mention a martial poem on the Klephts (*Poëma Klephtikon*, Par. 1820); but his masterpiece is his history of the Greek revolution (*Historia tes Hellēnikēs Epanastaseos*, Lond. 1853-54), a work which is praised for its accuracy, impartiality, and style.

TRICYCLE, a three-wheeled velocipede propelled by the feet and guided by the hands. It is constructed in a great variety of ways. Generally the two large wheels between which is the seat are in the rear, with a small guiding wheel in front, though these positions are varied.

TRIDACNIDÆ, a family of lamellibranchiate mollusks, having the shell open, the valves equal, the foot small, and furnished with a byssus. *Hippopus maculatus*, the bear's-paw clam, is prized for its beauty. *Tridacna gigas* is remarkable for its great size, exceeding that of any other bivalve. The shell of a single specimen has been known to weigh more than 500 lbs. The valves are sometimes used in Roman Catholic churches for holy-water vessels. They are also used as an ornament for grottoes and fountains. They are deeply furrowed and beautifully grooved. This great mollusk is a native of the East Indies, and is found in shallow water. It is used for food, and one suffices for a number of persons.

TRIDENT, in classic mythology, is used as the symbol of Neptune's sovereignty over the sea. It consisted of a staff, armed at one end with three short prongs, with double barbs at the points, resembling the *fuscina* used by the Italians in catching large fish, particularly the sword-fish, from which we may perhaps infer that Neptune was originally the god of fishermen. It was customary among the Grecian states to place the figures of their patron deities, or their appropriate symbols, on coins; hence, we fre-

quently meet with the trident on ancient coins, such as those of Saguntum, etc.; likewise on the Sicilian coins of Hiero, etc.

TRIDENTINE PROFESSION. See TRENT, COUNCIL OF.

TRIDYMITE (Greek, triplets), so called because the crystals are compounds of threes, is a modification of silica. The crystals are hexagonal in form, somewhat like quartz, but differing from it in that they possess double refraction; colorless and transparent; vitreous, pearly on the base. Tridymite was first discovered in the trachyte of San Christobal near Pachuca, in Mexico, in 1868, by the distinguished mineralogist, Von Rath. It has also been discovered in the Drachenfels, in Germany, and in Hungary. It has been identified elsewhere, and is thought by some to be a common mineral in some eruptive rocks, having been mistaken for quartz.

TRIENNIAL ACT, a statute of William III. (q.v.), ordaining that no parliament should last longer than three years. This period was extended to seven years by the Septennial Act of George I. (q.v.).

TRIEST, or TRIESTE (Slav, *Térsst*), the most important seaport of Austria-Hungary, and the most considerable trading town on the Adriatic, stands at the head of the gulf of Triest, an arm of the gulf of Venice, 90 m. s.w. of Laibach, on the Vienna and Triest railway. The city of Triest, in which the population of the district is almost wholly massed, the other places being only small villages, consists of the old town, the new town, or Theresienstadt, and the two suburbs, Josefstadt and Franzensstadt. The old town, built on the slope of a steep hill, surmounted by a castle, forms about a fourth of the whole city, and is distinguished by its narrow streets and black walls. It contains the cathedral, an early Byzantine edifice of uncertain date, into the walls of which stones bearing Roman inscriptions and carving have been built, and the tower of which is said to rest on the foundation of a temple of Jupiter. The new town, with broad streets built in regular parallelograms and handsome houses, occupies the plain that fronts the sea. Between these two divisions runs the *Corso*, the chief thoroughfare of the city. The *Tergesteum*, in the new town, is a splendid modern edifice, built in 1842, and containing a bazar, a grand concert and ball room, exchange and reading rooms, and the offices of the Austrian Lloyd's, the largest establishment in Europe for sea steamers. To the n., on the sea-shore, is the new and magnificent lazaretto, with a harbor in which 60 vessels can perform quarantine at once. There are numerous churches for Greeks, Jews, Roman Catholics, and Protestants. The population includes Germans, Americans, Italians, Greeks, Jews, Armenians, Dalmatians, etc.; but Italian is the prevailing language. Triest is a free port; and the harbor, the entrance to which is uninterrupted by islands or sandbanks, is well protected. The manufactures carried on here are very extensive. There are many establishments for shipbuilding, and great soap and rope-works. Rosoglio, white lead, and leather are manufactured, and wax-bleaching is carried on. Extensive operations have been gone through, giving nearly two miles of quays, which are protected by a pier built at a distance of 1000 feet from the shore and running parallel to the shore for 3600 ft. The value of the imports is about \$66,000,000; that of exports, \$62,000,000. Pop. in '90, including the suburbs, 157,648.

Triest, the ancient *Tergeste* or *Tergestum*, was of importance under the Romans, and first receives historical mention 51 B.C., when it was overrun and plundered by neighboring tribes. It was much improved by Augustus; and, in 1382, finally passed into the hands of Austria. It owes its prosperity chiefly to the emperor Charles VI., who constituted it a free port, and to Maria Theresa. Since the year 1816, Triest has borne the title of "the most loyal of towns." A new harbor was opened, 1883.

TRIFO'LIUM. See CLOVER.

TRIFO'RIUM, the arcade over the arches of a church between the central and side aisles. It is usually a dark gallery, being the wall-space against which the lean-to roof of the aisles rests. In the later styles, the side aisles were covered with independent roofs, so as to allow the triforium arches to be filled with glass.

TRIGG, a co. in w. Kentucky, drained by the Cumberland and Tennessee rivers, the latter its n. boundary; about 425 sq.m.; pop. '90, 13,902, chiefly of American birth, inclu. colored. The surface is hilly, and in great part covered by forests. The valleys are fertile and produce corn, wheat, tobacco, and pork. Iron ore is found. Co. seat, Cadiz.

TRIGGER. See LOCK.

TRIG'LA. See GURNARD.

TRIGLYPH, the ornament in the frieze of the Doric order (q.v.). It is supposed to represent the ends of the beams in the original wooden temples. It is always divided into channels or flutes, with guttæ or drops below.

TRIGONIA, a genus of mollusca, represented at the present day by only three species, natives of Australia, but remarkably abundant in the secondary rocks. Upward of 100 species have been described from strata between the trias and the chalk inclusive,

but not a single species is known from any tertiary deposit. The shell is trigonal (whence the name), thick, and tuberculated, or ornamented with radiating or concentric ribs. The interior is nacreous. The external ligament is small and prominent, and the huge teeth are large, diverging, and transversely striated. The animal has a long, pointed, and powerful foot, with which it is able to make considerable leaps. The gills are ample, and united behind the body to each other and to the mantle.

TRIGONOCARPON, a common fruit in the coal-measures, occurring in all the strata except the underclays and limestones. Some six or eight species have been established, which differ from each other in size and shape—some being as small as a pea, and others as large as a walnut. They are marked, when preserved in the round, with three longitudinal ridges, and from this character the name was derived. They have never been found attached to any plant. From their shape, and their occurring in such quantities in some localities that they might be gathered by the bushel, it was at first thought that they were palm-fruits; but Dr. Hooker, from the examination of several specimens which exhibit structure, has shown that they are not unlike the structure of *salisburia*, a drupe-bearing coniferous tree, a native of China and Japan. He found that they were composed of four distinct integuments, and a large internal cavity filled with carbonate of lime, but which, he supposed, originally contained the albumen and embryo. The determination of the affinities of this fruit is the more important, as the existence of conifers in the coal-measures was known from the occurrence in them of disk-bearing woody tissues; and the absence of linear leaves and cones makes it the more likely that they belonged to the drupe-bearing division of the order. It is probable that the trunk, to which the generic name *dadoxylon* has been given, and the casts of the large pith of which is known as *sternbergia*, had for its leaves the fern-like fossils named *noggerathia flabellata*, and *trigonocarpus* for its fruit. Dr. Dawson has, however, recently referred some *trigonocarpa* to *sigillaria*, and he considers the anomalous organism called *antholites* to be the bud-form of the fruit. He has never found them in contact with *sigillaria*, and it is much more probable that this was a cryptogamous tree, and consequently had spores, and not seeds, for its fruit.

TRIGONOCEPHALUS, a genus of extremely venomous serpents, of the family *crotalida*, nearly allied to rattlesnakes, but having the tail terminated with a spine instead of a rattle. The head is covered with plates or shields; the dorsal scales are keeled. *T. rhodostoma* may be mentioned as an example. It is found in Java, and preys chiefly on frogs. *Cenchris*, *craspedocephalus*, and other genera have recently been separated from *trigonocephalus*. The moccasin snake of the southern states of North America belongs to the genus *cenchris*. One of the most dangerous serpents of the West Indies is *craspedocephalus lanceolatus*.

TRIGONOMETRICAL SURVEY. Trigonometrical surveying is that higher branch of measurement of the earth's surface in which the use of angular instruments, such as the theodolite, altitude, and azimuth instrument or sextant, is indispensable in forming the network of triangles, on the accuracy of which the correctness of the survey depends. In the article **TRIANGULATION**, the necessary operations have been briefly adverted to, and in **SURVEYS, NATIONAL**, will be found notices of some of the principal modern trigonometrical surveys executed, or now being made. See also **GEODESY**.

In the *Aide Mémoire of Military Sciences*, conducted by officers of the corps of royal engineers, a very full and complete article will be found on this subject; and the government blue-books, from time to time issued on the surveys both of this country and India, afford much valuable information on the internal economy and arrangements necessary for carrying on such vast works.

When it is necessary to fix the astronomical position of the stations, of course, the transit, zenith sector, and other instruments used in the observatory, must be transferred to situations very often difficult of access, exposed to strong winds, etc., which adds much to the difficulty of getting correct observations. Meteorological and magnetic observations are often taken simultaneously with the astronomical; and, indeed, are now considered as nearly indispensable in modern operations. See **SURVEYING**, **TRIANGULATION**, etc.

TRIGONOMETRY (Gr. *trigōnon*, a triangle, *metria*, measurement), the measurement of triangles. This definition, though expressing correctly enough the scope of trigonometry in its early stages, is now wholly inapplicable, as trigonometry, like geometry, has far exceeded its primitive limits; and though the original name is, for convenience, retained, the science may be more properly defined as the "consideration of alternating or periodic magnitude." Trigonometry, within the limits of its earlier definition, is geometrical; its advance beyond these limits is due to the introduction of purely algebraic methods. The quantities with which geometrical trigonometry has to deal are certain lines definitely placed with respect to an angle, and consequently varying with it. These lines, generally denominated *trigonometrical functions* of the angle, are the sine, cosine, tangent, cotangent, secant, and cosecant, and are represented in the accompanying figure. The angle BAC is placed at the center of a circle, called the circle of reference; its *sine*,

CD, is the perpendicular let fall from the extremity of one radius upon the other; the *cosine*, DA, is that part of the radius between the foot of the sine and the center; the *tangent*, BE, is drawn at right angles to one radius to meet the other produced; the *secant*, AE, is the radius produced to meet the extremity of the tangent; the *cotangent*, FG, is drawn from the extremity of a radius at right angles to one of the former, to meet the other produced; and the *cosecant*, AG, is the radius produced to meet the extremity of the cotangent. Other functions, as the *versed sine*, DB, which is the distance from B to the foot of the sine, and its counterpart, the *covered sine*, FH, have been occasionally introduced and defined, but they are of no practical use. EAF, the angle which must be added to BAC to make up a right angle, is called the *complement* of BAC; and CAL, the defect of BAC from two right angles, is called its *supplement*; and by inspection of the figure we can see at once that the sine of BAC, CD, is equal to AH, the cosine of its complement; that the cosine of BAC, AD, is equal to CH, the sine of its complement; and that generally any function of an angle is the co-function of its complement, and *vice versa*; also, that CD, the sine of CAB, is also the sine of its supplement; AD, the cosine of CAB, is the cosine of its supplement; and that generally the function of an angle is the function of its supplement. If a right angle be added to BAC, then we have the triangles ADC, ABE, shifted so as to be situated in the same relative position to AF as they now are to AB, and each line is consequently at right angles to its former position; hence the sign of BAC is the cosine of $(90^\circ + \text{BAC})$, and similarly of the others. By an extension of this process of investigation we arrive at the general conclusions that *if an angle be added to or taken from one or an odd number of right angles, the function of the original angle is the co-function of the one so derived; and that if an angle be added to or taken from an even number of right angles, the functions of the original angle are the functions of the derived one.* But since a function of an angle is the same function of its supplement, a knowledge of the function would not enable us to determine to which of the two angles it belonged, unless we possessed some knowledge of more than the mere magnitude of the function. This desideratum is supplied in the following manner: B is taken as the zero-point of reckoning, the radius BA, which is thus supposed to be fixed, is one of the bounding lines of every angle, the other side being supposed to move in the direction BFL, as the angle increases. Let the radius AC be supposed to sweep round the circle in a left-hand direction (viz., toward F), then, as it approaches F, the sine CD increases, till, on reaching F, the sine coincides with the radius; passing F, and moving toward L, the sine diminishes, till, on reaching L, it becomes zero. Continuing its progress round the circle, the angle BAC becomes *re-entrant* (viz., greater than two right angles); and its sine again increases, becoming equal to the radius at M, and diminishing in the fourth quadrant till it becomes zero at B. While the angle increased from B to L, the sine was drawn *downward*; for the other half of the revolution, it was drawn *upward*; hence, in the first and second quadrants, the sine is said to be *positive*, and in the third and fourth, *negative*, the position of a function in the first quadrant being adopted as the standard. The following table shows the variation (increase or decrease, and between what limits, as well as the sign affecting it) of each of the functions as the angle increases:

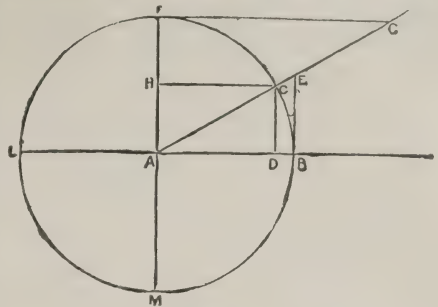


FIG. 1.

Angle. Sine. Cosine. Tangent. Secant. Cotangent. Cosecant.

| | | | | | | |
|-------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 0° to 90° | inc. 0 - R, + | dec. R - 0, + | inc. 0 - ∞, + | inc. R - ∞, + | dec. ∞ - 0, + | dec. ∞ - R, + |
| 90° " 180° | dec. R - 0, + | inc. 0 - R, - | dec. ∞ - 0, - | dec. ∞ - R, - | inc. 0 - ∞, - | inc. R - ∞, - |
| 180° " 270° | inc. 0 - R, - | dec. R - 0, - | inc. 0 - ∞, + | inc. R - ∞, - | dec. ∞ - 0, + | dec. ∞ - R, - |
| 270° " 360° | dec. R - 0, - | inc. 0 - R, + | dec. ∞ - 0, - | dec. ∞ - R, + | inc. 0 - ∞, - | inc. R - ∞, - |

We here observe that all the functions increase and decrease alternately as the angle of which they are the functions passes from one quadrant to another; also that the sine and cosecant are affected by the same signs, as also are the cosine and secant, and tangent and cotangent.

Again, from fig. 1, we obtain, from the properties of right-angled and of similar triangles, the following relations between the functions: $\text{Sin.}^2 + \text{cos.}^2 = R^2$, $\text{tan.}^2 + R^2 = \text{sec.}^2$, $\text{cot.}^2 + R^2 = \text{cosec.}^2$, $\text{tan.} : R :: \text{sin.} : \text{cos.}$, $\text{sec.} : R :: R : \text{cos.}$, $\text{cot.} : R :: \text{cos.} : \text{sin.}$, $\text{cosec.} : R :: R : \text{sin.}$, and $\text{cot.} : R :: R : \text{tan.}$. From these eight relations we can easily obtain any one function in terms of any other, both as regards its magnitude and sign.

The reason why the circle and its radius are employed in the definition of the functions is that we may obtain some invariable standard by which to estimate them, for

while, as the angle increases from 0° to 360° , its functions are in a state of constant change, their standard of reference, the radius, remains the same. For greater simplification the radius is taken as unity, and the relations become $\sin.^2 + \cos.^2 = 1$, $\tan.^2 + 1 = \sec.^2$, $\cot.^2 + 1 = \text{cosec.}^2$, and (by the reduction from the proportional to the divisional form of the other five relations) $\tan. = \frac{\sin.}{\cos.}$, $\sec. = \frac{1}{\cos.}$, $\cot. = \frac{\cos.}{\sin.}$, $\text{cosec.} = \frac{1}{\sin.}$, $\tan. =$



FIG. 2.

$\frac{1}{\cot.}$; the various functions being expressed in terms of the assumed unit. Thus, in the right-angled triangle ABC (fig. 2), if AC be radius, BC = sin., and AB = cos., of the angle A; but if the radius be assumed as unity, $\sin. A = \frac{BC}{AC}$, $\cos. A = \frac{AB}{AC}$, and similarly from the above relations, $\tan. = \frac{BC}{AB}$, $\sec. = \frac{AC}{AB}$,

$\cot. = \frac{AB}{BC}$, and $\text{cosec.} = \frac{AC}{BC}$; and in algebraic trigonometry these latter are the definitions of the trigonometrical functions.

The only angular functions which geometry enables us to determine with accuracy are those belonging to the angles of an equilateral triangle (Euc. I. 1), an isosceles right-angled triangle (Euc. II. 9), and an isosceles triangle which has each of the angles at its base double of the third angle (i.e., base angles each 72° , vertical angle, 36°) (Euc. IV. 10); and from these, by means of a proposition (demonstrated in all text-books on the subject) which determines the functions of the angle $(A + B)$ from a knowledge of the functions of A and of those of B; and also, as a corollary to the preceding, the functions of $2A$, $4A$, $8A$, etc., and inversely of $\frac{1}{2}A$, $\frac{1}{4}A$, etc., from a knowledge of those of the angle A, have been obtained and tabulated the functions of all angles from $1'$ to 45° , the functions of angles from 45° to 360° being, as is evident from the above remarks respecting complementary and supplementary angles, merely repetitions of these.

The relations between the angles and sides of a triangle are three in number, and are obtained from simple geometric considerations; they are —(1) $AB : AC :: \sin. C : \sin. B$; (2) $\cos. B = \frac{AB^2 + BC^2 - AC^2}{2AB \cdot BC}$; (3) $AB + AC : AB - AC :: \tan. \frac{1}{2}(B + C) : \tan. \frac{1}{2}(B - C)$. From these relations in conjunction with the fact that the three angles of a triangle collectively amount to 180° , it is possible, having given any three (one being always a side) of the six elements (three sides and three angles) of a triangle, to determine the other three. It is this that constitutes trigonometry in its primitive and elementary form. If the triangles be right-angled, only the first relation and the property of the sides of a right-angled triangle, are necessary for the complete solution. Further information on this subject will be found in any text-book.

Algebraic trigonometry is one of the most important branches of analysis, but it is too extensive and varied to be even sketched here; suffice it to say, that in it the trigonometrical functions are not considered as geometrical magnitudes, but as numerical quantities having certain relations to each other, and that the circle as well as the angular functions are treated as multiples or sub-multiples of the radius. Many important results, such as the approximate estimation of the circumference of a circle, the completion of the solution of cubic equations, etc., have been obtained by its means; and a thorough knowledge of its modes and results is absolutely necessary to an acquaintance with higher mathematics.

Spherical trigonometry is plane trigonometry applied to spherical triangles. See any text-book.

TRIKHALA, or **TRIKALA**, a t. in Greece, situated 33 m. w. of Larissa. It is built on the slope of a hill, manufactures cotton and woolen stuffs, and has a large transit-trade. The neighboring plains which are watered by the Salambría (anc. *Peneus*), are rich in all sorts of fruits. Pop. - '89, 14,820. Trikhala is the *Trikka* of Homer, and was celebrated in the classic ages for its temple of Æsculapius.

TRILL. See **SHAKE**.

TRILLIA'CEÆ, a small natural order of plants, belonging to the class dictyogens (q.v.) of Lindley. They are herbaceous plants, with tubers or root-stocks, whorled leaves, hermaphrodite flowers; perianth of six leaves, the three inner leaves sometimes colored: six, eight, or ten stamens, the filaments extending beyond the anthers in awl-shaped points; the ovary free, 3 to 5-celled, with numerous ovules; the fruit succulent. The order is characterized by narcotic properties. The genus *paris* (q.v.) belongs to it.

TRIL'LIUM, a genus of herbaceous perennial plants of North America, of the lily family; embracing about a dozen species, growing in moist and shady (not marshy) grounds from Maine to Florida. They have a naked stem, 10 to 15 in. high, terminated by three ovate, pointed, broad, beautifully netted-veined leaves. The *T. grandiflorum*, or wake-robin, is one of our most beautiful wild flowers, growing in rich woods (preferably alluvial) from Vermont to Kentucky, Wisconsin, and northward. The

flowers, which appear in June, at first nearly white, but changing with age to rose-color, are borne on a peduncle from 2 to 3 in. long.

TRILOBITES, an order of fossil crustacea entirely confined to the paleozoic rocks. They are specially abundant in the Silurian period, and disappear in the lower members of the coal-measures. See illus., **CRUSTACEANS, ETC.**, vol. IV.

The body was covered with a chitinous shield, which consisted of a large united cephalic shield, a variable number of body segments, and a tail or pygidium, composed of a number of joints, more or less anchylosed. The eyes were sessile and compound. The lenses are frequently beautifully preserved, and in some species are so large that they can easily be seen with the naked eye. In *asaphus caudatus*, each eye had at least 400 facets; and in the large *A. tyrannus*, it is estimated that there are about 6,000. In some species, a bifurcated plate has been found in the region of the mouth, which is believed to be a labrum, but no antennæ or limbs have been yet detected in any specimen. They may have been entirely destitute of antennæ, as in some living animals to which they are nearly related these organs are very rudimentary; and their feet were probably soft and leaf-like appendages, bearing the gills, which would speedily perish, and leave no traces in a fossil condition. The sexes are believed to be indicated by variations in the length of the cephalic and caudal spines, and in the prominence of the head lobes. The members of the order varied greatly in size, some species being scarcely larger than a pin's head, while others, like *asaphus gigas*, attained a length of 18 inches. It is probable that many named species may be only larval or transition forms of others. The minute *agnosteus* is frequently found in such quantities as to indicate that it lived in shoals, as if it were the larval form of some large trilobite. Burmeister considers that trilobites have their nearest allies in the minute phyllopoda, a section of entomostracous crustacea, which live in stagnant water, and are never at rest, but continually swimming at various depths on their backs, some being so near the surface of the water that their feet touch it. He consequently supposes that trilobites lived gregariously in shallow water close to shore, moved only by swimming near the surface, and could not creep at the bottom; that they swam in an inverted position, with the belly upward; that they made use of their power of rolling themselves into a ball as a defense against attacks from above; and that they lived on smaller water-animals.

Above 400 species have been described, and grouped into 50 genera. Of these, 46 are Silurian, 22 Devonian, and 4 carboniferous.

TRIOLOGY, the name given by the Greeks to a group of three tragedies, either connected by a common subject, or each representing a distinct story. A satyric drama was customarily added as a termination, whence the whole was sometimes termed a *tetralogy*. Every tragic poet that wished to take part in a poetic contest had to produce a trilogy along with a satyric drama at the Dionysiac, Lenæan, and Anthesteriac festivals. We possess only one perfect specimen of the classic trilogy—the *Oresteia* of Æschylus, which embraces the *Agamemnon*, the *Choëphoræ*, and the *Eumenides*.—See Welcher, *Die Aeschylische Trilogie* (Darmst. 1824); Franz, *Des Aeschylus Oresteia* (Leip. 1846).

TRIMBLE, a co. in n. Kentucky, separated from Indiana by the Ohio river; about 155 sq. m.; pop. '90, 7140. Co. seat, Bedford.

TRIMBLE, ISAAC RIDGEWAY, 1802–88, American military officer, graduated at West Point in 1822, but resigned his commission in 1832 in order to follow the profession of civil engineer. When the war broke out he received a commission as colonel of engineers from the state of Virginia, and served with distinction on the Confederate side throughout the war, rising to the rank of major-general. He rendered good service in many important engagements, and took part in General Pickett's charge at the battle of Gettysburg, where he lost a leg and was captured. From the surrender to the time of his death he was a resident of Baltimore.

TRIMETHYLAMINE, or **TRIMETHYLIA** (C_3H_9N , or $3C_2H_5N$), is a very remarkable organic base, with an extremely powerful and disagreeably fishy odor. It is obtained as a colorless gas, readily soluble in water, and having a strong alkaline reaction. With acids, it readily forms soluble salts. It occurs in large quantity in the pickle in which herrings (especially their roes) have been lying, and in the spirit in which old anatomical preparations have been long suspended; and (strange as it may appear) it imparts to the leaves of *chenopodium olidum* their atrocious odor, and to the flowers of *cratægeus oxyacantha* (the common hawthorn) their agreeable fragrance. It is obtained by distillation from ergot of rye, from guano, the juice of the leaves of red beet-root, and from putrid yeast, and has been detected in small quantity in human urine and in the blood of the calf. It may be formed artificially by the action of iodide of methyl on dimethylamine; but the source from which it may most readily be derived is herring-brine.

TRIMMER, a political term in use in the reigns of Charles II. and William III., originally applied to certain politicians of Charles's time, of whom the chief was Charles Montagu, earl of Halifax, who held opinions half-way between the extreme whigs and tories. Halifax adopted the name trimmer as a title of honor, maintaining that everything good was a medium between extremes.—The same term was applied more generally by Dryden and other writers of the same period to all who, professing to be friends to monarchy, were at the same time enemies to the duke of York, and who were equally obnoxious to the court and to the fanatical republicans.

TRIMURTI (from the Sanskrit *tri*, three, and *mūrti*, form), is the name of the Hindu triad, or the gods *Brahman* (masculine), *Vishn'u*, and *S'iva*, when thought of as an inseparable unity, though three in form. The *Padma-Purān'a* (see *PURĀN'A*), which, being a *Purān'a* of the *Vaishn'ava* sect, assigns to Vishn'u the highest rank in the *Trimūrti*, defines its character in the following manner: "In the beginning of creation, the great Vishn'u, desirous of creating the whole world, became three-fold: creator, preserver, and destroyer. In order to create this world, the supreme spirit produced from the right side of his body himself as *Brahman*; then, in order to preserve the world, he produced from the left side of his body Vishn'u; and in order to destroy the world, he produced from the middle of his body the eternal *S'iva*. Some worship *Brahman*, others Vishn'u, others *S'iva*; but Vishn'u, one, yet three-fold, creates, preserves, and destroys; therefore, let the pious make no difference between the three." And the *Matsya-Purān'a*, where speaking of *Mahat*, or the intellectual principle of the *Sāṅkhya* philosophy (see *SĀṆKHYA*), says that "*Mahat* becomes distinctly known as three gods, through the influence of the three qualities, goodness, passion, and sin; being one person and three gods—viz., *Brahman*, Vishn'u, and *S'iva*." Apart, therefore, from sectarian belief, which makes its own god the highest, and gives him the attributes also of the other gods, *Trimūrti* implies the unity of the three principles of creation, preservation, and destruction, and as such belongs more to the philosophical than to the popular belief. When represented, the *Trimūrti* is one body with three heads: in the middle, that of *Brahman*; at its right, that of Vishn'u; and at its left, that of *S'iva*. The symbol of the *Trimūrti* is the mystical syllable *om*, where (*o* being equivalent to $a + u$) *a* means *Brahman*; *u*, Vishn'u; and *m*, *S'iva*. See *OM*.

TRINCOMALEE, a sea-port t. and magnificent harbor on the n.e. coast of Ceylon, in 8° 33' n., and 81° 14' east. The town is built on a bold peninsula, which divides the inner and outward harbors. It is a place of great antiquity, but its ancient renown was due more to religious than political or geographical considerations, for it was here that the Malabar invaders of Ceylon built one of their most sacred shrines—the "Temple of a Thousand Columns," to which pilgrims flocked from all parts of India. This celebrated shrine was demolished by the Portuguese, who fortified the heights with the materials derived from its destruction, 1622 A.D. It was next held by the Dutch; but in 1672, during the rupture between Louis XIV. and the United Provinces, the French took Trincomalee, which was abandoned by the Dutch in a panic. In 1782 the French admiral, in the absence of the British commander, took possession of the fort, and the English garrison retired to Madras. It was restored to the Dutch the following year, and they retained it until the capture of Ceylon by the British in 1795. The modern town is in no way remarkable, and, with the exception of the official buildings, makes a poor appearance. There are Hindu temples in barbarous taste, and religious festivals and processions to which a similar epithet may be applied. The bay of Trincomalee is land-locked, and presents a scene of tranquil beauty; its fine expanse of water is still as an inland lake, and equally sheltered. "On comparing this magnificent bay," says sir J. E. Tennent, "with the open and unsheltered roadstead of Colombo, and the dangerous and incommodious harbor of Galle, it excites an emotion of surprise and regret that any other than Trincomalee should have been selected as the seat of government and the commercial capital of Ceylon. As a harbor, Trincomalee is renowned for its extent and security; but its peculiar superiority over every other in the Indian seas consists in its perfect accessibility to every description of craft in every variation of weather." The mean temperature for the year at Trincomalee is 81°.4. Pop. '91, 11,411.

TRING, a t. of Hertfordshire, Eng., 32 m. n.w. from London, near the right bank of the Ouzel, a branch of the Ouse. It is a neatly built town; has manufactures of silk, canvas, and straw-plait, and is a station on the London and North-western railway. The Grand Junction canal passes not far from it. Pop. '91, 4525.

TRINGA. See *SANDPIPER*.

TRINIDAD, an island belonging to Great Britain, and the most southerly of the West India islands, being in lat. 11° north. It is about 50 m. long, varying in breadth from 30 to 35 m., and the area amounts to 1754 sq. miles. It is separated from the mainland (Venezuela) by the gulf of Paria, and the extreme points on the w. coast are only 13 and 9 m. respectively from it. The Dragon's Mouth entrance, to the n., is the deepest channel to the harbor; and the southern, or Serpent's Mouth, is shallow, owing to the deposits brought down by the Orinoco. The gulf itself is shoaling up from the same cause. The aspect of the island of Trinidad is different from that of the Caribbean islands generally: the mountains are not so lofty, and they extend in an e. and w. direction along the northern coast, clothed with stately forests, and their margins fringed with overhanging mangroves, dipping into the sea. From the double-peaked mountain called Tamana, are seen the lovely and fertile valleys and plains with which the other part of the island abounds. The island has several good harbors, and some tolerably large rivers.

The chief town, Port of Spain, is one of the finest towns in the West Indies. It was originally built of wood, but was burned down in 1808, and the town has since been re-

built of the good stone procured in the neighborhood. The streets are long, wide, well paved, clean, and shaded with trees. It had a population (1891) of 33,782.

A remarkable phenomenon is a pitch lake near the village of La Brea, composed of bituminous matter floating on the surface of fresh water, about 3 m. in circumference, and 80 ft. above the sea. The mineralogy of the island is but little known. The soil is very rich and productive. The climate is hot and moist; the thermometer ranges from 75° to 85°, sometimes 90°; and the rainfall is about 75 inches.

The most important products are cocoa, sugar, rum, molasses, coffee, cotton, arrow-root, cocoa-nut oil, hides, etc. The value of the exports in '95 was £2,065,104; imports, £2,276,864. The pop. of the island in '95 was estimated at 237,934, being an increase of \$1,806 over that shown by the census of '81. Trinidad is a crown colony, ruled by a governor, an executive council of 7 and a legislative council of 9 official and 11 non-official members. The revenue in 1895 was £552,275; the expenditure, £549,771. The first railroad in Trinidad, extending from Port of Spain to Arima, a distance of 16 m., was opened for traffic in '76, and in 1891 there were in operation a length of 54 m. Tobago was annexed to Trinidad, Jan. 1, 1889. It has an area of 114 sq. m. and a pop. (1894) of 20,039.

Trinidad was first discovered by Columbus in 1498, and thus named by him because three mountain summits were first seen from the mast-head when discovered; but no permanent establishment was founded there until 1532 by the Spaniards. In 1595, its chief town, San José de Oruña, was burned by Sir Walter Raleigh; but the island remained a Spanish possession till 1797, when it fell into the hands of the British, who obtained possession by treaty in 1802. Its productiveness dates from 1781, when foreign immigration began. The administration of Lord Harris, 1846-51, was of great assistance in the regulation of the labor question consequent upon emancipation, and in the equalization of duties on free and slave-grown sugar.

TRINITY, DOCTRINE OF THE, is the highest and most mysterious doctrine of the Christian religion. It declares that there are three persons in the Godhead, or divine nature—the Father, the Son, and the Holy Ghost, and that “these three are one true, eternal God, the same in substance, equal in power and glory—although distinguished by their personal properties.” The most elaborate statement of the doctrine is to be found in the Athanasian creed, which asserts that “the Catholic faith is this: That we worship one God as Trinity, and Trinity in Unity—neither confounding the persons nor dividing the substance—for there is one person of the Father, another of the Son, and another of the Holy Ghost. But the Godhead of the Father, and of the Son, and of the Holy Ghost is all one; the glory equal; the majesty co-eternal.”

It is admitted that the doctrine is not found in its fully-developed form in the Scriptures; but it is supposed to be clearly revealed in its elements in the New Testament, and also to be indicated in many of the statements and revelations of the Old Testament. The form of expression in speaking of God in the Old Testament Scriptures—the plural *Elohim*, coupled with a singular verb; the apparent distinction recognized in the revelations to the patriarchs and Moses between Jehovah and “the angel of Jehovah;” the mode in which “the Spirit” and “word” of God, and “wisdom” (Proverbs viii.) are spoken of; and the gradual unfolding of the doctrine of a “Messiah,” are all supposed to be indications from the earliest times of the truth of a plurality of persons in the Godhead; and in the New Testament Scriptures the doctrine is represented as clearly taught in the Trinitarian formula of baptism—the general character of the claims and prerogatives of Jesus Christ, especially the ascription to Him of the designation “the Son of God,” and in the functions attributed to the Holy Spirit. The evidence is held conclusive of the equal divine nature and yet distinct personality of the Son and the Spirit along with God the Father. It is generally conceded, however, that the Christians of the 2d, and even of the 3d c., were far from having a clearly understood and recognized doctrine on this high subject. They were content for the most part to use Scriptural expressions in speaking of the Father, and the Son, and the Spirit, without defining articulately their relation to one another. It was not till the progress of opposing heresies sought, on the one hand, to degrade the divine dignity of Christ (Ebionitism in its various forms, and Arianism); or, on the other hand, to confound the personality of Christ with God the Father—a heresy known in its special form as Patripassianism—that the church was led to define in the Nicene creed the relation of the Son to the Father; and further, in the Nicæno-Constantinopolitan creed, the relation of the Spirit to the Father. This creed was specially directed against the opinions of Arius. A further clause was afterward added, known as the *filioque* clause, which determined the procession of the Spirit from the Son as well as the Father; but this clause, and the doctrine which it embodies, was never accepted by the eastern church, to whose finer speculative genius is owing the determination of the controversies which began in the 3d c., regarding the divine nature. The western or Latin church had a far less refined genius for such speculations; and in so far as it meddled with them, has imparted to them a coarser and more contradictory aspect. What is known as the “Athanasian creed,” which is now well understood to be of Latin, and not of Greek origin, is a sufficient illustration of this.

It is not our part here to criticise the evidence for the doctrine of the Trinity, or the validity of the doctrine itself; it is enough to say that the evidence which we have briefly

sketched in outline, has been accepted as satisfactory, not only by the Roman Catholic and oriental communions, but also by all the great Protestant communions. The only exception in modern times to the reception of the doctrine is in the case of the Socinians or Unitarians, who occupy in their teaching very much the position of the ancient Humanitarians (Ebionites). They reject the doctrine of the Trinity as incredible, and regard Christ merely as a higher prophet. There have, however, been various thinkers within the Christian church, such as Dr. Samuel Clarke in the beginning of last century, who, while accepting generally the doctrine of the Trinity, have rejected the special terms in which it is defined in the creeds, and whose views have been known as semi-Arianism. The doctrine of the Trinity, as a *doctrine* has reference only to the fact as revealed; while *theories* respecting it are attempts to state the mode, which is unrevealed and unknown. A man may have faith in the doctrine without attempting to form any theory concerning it; his faith may rest on evidence appropriate and sufficient for the fact, while his theory may appear to other minds irrational or inconsistent with faith; his faith may be steadfast, while his theoretical views may change with his years, studies, and associations with other minds. Prof. Edwards A. Park writes thus, in *Bibliotheca Sacra*, April, 1881: "A theologian may adopt the following definition of the Trinity: The Father is God; the Son is God; the Holy Spirit is God; the three are distinct from each other by a necessity of their very substance; neither is God without the others; and there is only one God. Here is the doctrine, stated without using technical terms. A theory of the doctrine is, that God is only one person in the psychological sense of that word, but exists in three distinct modes—ontological and necessary modes of subsistence, and not modes of mere action or manifestation. The first of these modes is the ground on which it is distinctively proper for him to perform one class of official acts; the second is the ground on which it is distinctively proper for him to perform another class of official acts; the third is the ground on which it is distinctively proper for him to perform a still different class. As each mode is distinct from the other two, each is called a *distinction*. As each is the ontological basis of a distinct property, each is called a *subsistence*, an *hypostasis*. As each is the ontological basis on which personal acts ultimately depend, each is called a *person* in a technical, not in the philosophical sense of the word. As each of these modes is relative to the other two, each is called an *internal relation*. God is said to exist in the three modes, distinctions, persons, relations; and the three are said to exist in him; and the three are said to *be*, as well as to be *in*, the one God. On this theory the different *ὑποστάσεις* have only one consciousness, one will, one set of attributes; the unity being plain, the trinity being mysterious. A different theory is that the three divine Persons have each a distinct consciousness, a distinct will, a distinct set of attributes; the unity being mysterious and the trinity plain. A modification of this theory is that the Godhead consists of three minds, each one of which has a consciousness of the other two, and is thus one with them. A not uncommon theory is that the infinite mind differentiates itself from itself, and then unites itself with itself; the subject projecting itself into an object of consciousness is the first Hypostasis; the object being known by the subject is the second Hypostasis; the knowledge identifying the object with the subject, or the love uniting the two, is the third Hypostasis. This general proposition in diversified forms lies at the basis of theories which do not exhibit it on the surface. In the earlier period of his life Melancthon said: 'These mysteries (the doctrines of God, the Trinity, the person of Christ) are better revered than inquired into.' At a later period he defined the Trinity as 'the eternal necessary process of the divine self-consciousness, in which God, whose thoughts are realities, eternally sets himself over against himself, but also again unites with himself.'"

TRINITY, a co. in n.w. California, drained by Trinity and Mad rivers; traversed by the Coast range of mountains in the e.; about 3000 sq.m.; pop. '90, 3719, chiefly of American birth. The surface is mountainous and little cultivated. Gold is found in large quantities. Co. seat, Weaverville.

TRINITY, a co. in e. Texas, drained by the Trinity and Neches rivers—its n.e. and s.w. boundaries; about 710 sq.m.; pop. '90, 7648, chiefly of American birth, incl. colored. The surface is level, heavily wooded, and fertile; cotton, cattle, corn, and pork are the staples. Co. seat, Groveton.

TRINITY, a river of California, rising near the Coast range, and flowing through a country of rich gold mines into the Klamath river; about 130 m. long.

TRINITY, a river of Texas, is formed by the union of two streams, West Fork and Elm Fork, which rise near the northern boundary of the state, and unite 150 m. s.e., the main stream flowing thence 550 m. in the same general direction to Galveston bay, about 40 m. n. of the city of Galveston. It is navigable 300 to 500 miles.

TRINITY CHURCH, New York. The charter was granted to the corporation in 1693, and the first church building was begun in 1696. This building was enlarged in 1737, and destroyed by fire in 1776. The next church was built in 1788, and pulled down in 1839 to make room for the present edifice, which was completed in 1846. In 1705 Lord Cornbury, the gov. of N. Y., acting for Queen Anne, made a lease to the corporation of Trinity church, whereby was granted to them forever, at an annual rental of 3 shillings a year, the land called the queen's farm and the queen's garden. This rent

was commuted and satisfied in 1786. The land so granted was a large tract at the lower end of Manhattan island, and being the business centre of New York, is now of immense value. The state at one time attempted to get possession of the property, on the ground that it was crown land, and the title had not been properly conveyed. It has also been claimed that, at the time the queen made the grant to the Trinity corporation, the title was not in her, it having been previously patented by the Dutch government to Anneke Jans (q.v.). The parish now contains 7 church buildings: Trinity church, St. Paul's chapel, St. John's chapel, Trinity chapel, St. Chrysostom's chapel, St. Augustine's chapel, and St. Cornelius's chapel. They all, except St. Cornelius, have parish and industrial schools, some of which are doing large and successful work among portions of the population not otherwise reached by Christian or moral influences.

TRINITY COLLEGE, Dublin. See DUBLIN, UNIVERSITY OF.

TRINITY COLLEGE, Cambridge, was founded by king Henry VIII., in 1546, upon the site, and partly out of the revenues of several more ancient foundations. The names of these were King's Hall, Michael House, Fyswicke's Hostel, Hovinge Inn, Gregory's, Margaret's, Catherine's, Gerard's, and Tyler's Hostels. Of these, the first two deserve special mention. King's Hall (*Aula regis*) was so called after its founder, Edward III., whose father, Edward II., had maintained 32 scholars, called king's scholars, but had died before completing his intentions. The hall was founded in 1337. The master's stipend was 4d., and that of each scholar 2d. per day, with two robes at Christmas. The revenues of King's Hall at the time of its surrender to Henry VIII. amounted to £214 per annum.

Michael House was founded 1324 A.D. by Hervey D. Stanton, who was chancellor of the exchequer to Edward II. He dedicated his college to the Trinity, the Virgin Mary, St. Michael the Archangel, and All Saints. When Henry VIII. united these smaller foundations into the one great college, henceforth called TRINITY COLLEGE, besides other endowments, he added the estates of 27 dissolved monasteries, which made up the gross revenues to about £1700 per annum. Queen Mary added very largely to these benefactions, and provided for 20 additional scholars, 13 poor scholars or sizars, 4 chaplains, and a choir. Queen Elizabeth gave to the college a new set of statutes, by which the college was governed until the reign of Queen Victoria, when these statutes were revised. Subsequently, under the Cambridge university commission (1859-60), new statutes have again been given, by which several important changes have been introduced. Such fellows as fill the office of bursar, tutor, or lecturer in the college, or professor in the university, are exempt from the necessity of taking holy orders, which must otherwise be done by all fellows within seven years of taking the degree of master of arts. Marriage also is permitted to fellows in a few exceptional cases, and to the chaplains and librarian. The master of the college must be in holy orders, and the appointment is in the gift of the crown. The following are some of the more eminent names in the list of masters: John Whitgift, who was raised to the see of Worcester; Thomas Nevile, dean of Canterbury, who built the greater part of the cloistered court known by his name; he died 1615. To Dr. Barrow, who was made master in 1672, the college owes the finishing of Nevile's court, and the erection of the library, for which the designs were furnished by sir Christopher Wren. The famous Dr. Bentley was master from 1700 to 1742. The late William Whewell was one of the most distinguished men that this college has produced, and one of the best of its masters. He was a munificent benefactor to the college, to which he added one new court during his life; and at his death bequeathed his large fortune to the building of another, and to the founding of a professorship of international law. See **WHEWELL**. To these may be appended the following few names of popular interest, with the dates of their death: lord Bacon, 1626; sir Edward Coke, 1634; Cowley, the poet, 1667; lord William Russell, executed 1683; John Dryden, 1701; Samuel Pepys, the diarist, 1703; sir Isaac Newton, 1727; Richard Porson, 1808; lord Macaulay, 1859; while among the names of graduates who have died more recently is that of Alfred Tennyson, the poet laureate, 1892.

The foundation now consists of a master, 60 fellows, and 74 scholars. The present master is the Rev. William Hepworth Thompson, D.D.

With the exception of the hall and the library, the college buildings are not of any architectural pretensions. The statue of Newton by Roubillac, in the ante-chapel, is one of the finest modern statues.—See Cooper's *Annals and Memorials of Cambridge*; Dyer's *History*; and the *University Calendar*. The judges when on circuit have the right of being entertained at this college.

TRINITY COLLEGE, Oxford. In 1290 Richard de Hoton, prior of Durham, founded Durham college, at Oxford, for the education of the student-monks of Durham. At the dissolution of the monasteries, the property of this institution was transferred by Henry VIII. to the newly erected chapter of Durham cathedral. Its site and buildings, however, passed into the hands of sir Thomas Pope, who, in 1554, obtained a license from Philip and Mary to found a college on the spot, to be called Trinity college, for the maintenance of 20 scholars, of whom 12 were to be fellows, and 8 scholars, properly so called. The scholars were to be elected from the founder's manors, and the fellows from the scholars. In 1557 sir Thomas Pope added four scholarships; and about the same time another was added by a Mr. Blount. There are also two exhibitions. By the ordinances issued by the commissioners under 17 and 18 Vict. c. 81, the fellowships and

scholarships are thrown open without restrictions; the latter are tenable for 20 terms, value £80 a year, besides rooms. This is the first college, after Balliol, which was founded by a layman, as were all colleges subsequent to this date. It is also remarkable as having been, like St. John's, founded by a Roman Catholic after the Reformation. It presents to 11 benefices.

TRINITY COLLEGE, Hartford, Conn., under the control of Protestant Episcopalians; founded 1823 under the name of Washington college, which it bore until 1845. The old buildings were on the site now occupied by the state capitol. In 1878 the college was removed to its present location on a bluff in the southwest part of the city, where the western side of a great quadrangle, 600 feet in length, including two blocks of buildings and central towns, has been erected. There are also an observatory and a fine laboratory building on the south campus, and a gymnasium with alumni hall and a president's residence on the north campus. The courses of instruction, making ample provision for alternative and elective studies, lead to degrees in arts, science, and letters; and arrangements are also made for special students. The faculty numbered 20 in 1897, and the students 128. There is a library of over 37,000 volumes and a good museum. Geo. Williamson Smith, D.D., president.

TRINITY HALL, Cambridge. This college, which is distinct from Trinity college, was founded 1349-50 A.D. for scholars of canon and civil law, as well as for the education of clergy, by William Bateman, bishop of Norwich, who was also co-founder of Gonville and Caius college. It appears that the bishop was induced to found the college in consequence of the great pestilence which had recently swept away most of the clergy of his diocese, so that there could not be found sufficient to supply the parochial cures. In a bull of pope Clement VI., dated at Avignon, 1349, it is stated that there were at that time no less than 1000 parishes in the diocese void of incumbents. The first master was Robert de Stratton. There are thirteen fellowships, of which ten may be held by laymen for ten years, and are not vacated by marriage. There are also five law student-ships, sixteen scholarships, and two exhibitions.—See Cooper's *Memorials and Annals*, and Dyer's *History of Cambridge*; also the *University Calendar*.

TRINITY HOUSE (properly called, The Corporation of the Elder Brethren of the Holy and Undivided Trinity), a corporation intrusted with the regulation and management of the light-houses and buoys of the shores and rivers of England. In 1518 a society under the above name was founded at Deptford by sir Thomas Spert, knight, and incorporated by Henry VIII. Its privileges were confirmed in 1658; and in 1680 its first light-house was erected; all the light-houses which had previously existed on the English coast having been built by private individuals under patents from the crown. By 6 and 7 Will. IV. c. 79, and the merchant shipping act, 1854 (17 and 18 Vict. c. 104), private rights in light-dues were abolished, and the exclusive right of lighting and buoying the coast committed to the board of Trinity House. The power of Trinity House to appoint and license pilots for the English coast is also regulated by this last-named statute. The Cinque ports pilots, who had formerly been under control of a separate society, were, by 16 and 17 Vict. c. 129, and the merchant shipping act, 1854, placed under the jurisdiction of Trinity House. Trinity House was in the practice of distributing certain funds arising from light and pilotage dues, and from the sale of ballast, for certain charitable purposes; but the right which the society possessed to the surplus of light-dues was done away with by the merchant shipping act, 1854. This same act gave Trinity House a general supervision over the commissioners of northern lights and the ballast board of Dublin, the corporations which have the charge of the light-houses and buoys of Scotland and Ireland respectively, subject to an appeal to the board of trade, to whose general superintendence Trinity House is also subject in matters relating to England. The light-houses of the isle of Man are, by special arrangement, under the charge of the commissioners of northern lights.

TRINITY SUNDAY, the Sunday immediately following Pentecost Sunday, so called as being set aside for the special honor of the blessed Trinity. The date of the origin of this festival has been a subject of much controversy. No such festival as Trinity Sunday was known to the fathers of the early centuries. The most decisive evidence of its non-acceptance by the general church up to the 9th or 10th c., is the absence even to this day of any corresponding festival in the separated Greek church; and although it seems quite certain that the festival was introduced in certain particular churches of the west, at earlier and varying dates, the general establishment of Trinity Sunday as a common festival of the whole western church dates from a decree of John XXII., who died in 1334. Nevertheless, the mass and office peculiar to the day are of much greater antiquity, and may be traced, at least in part, in several sacramentaries and other liturgical books of the earlier centuries.—See Benedict XIV., *De Festis*, i. 2, 10; Binterim, *Denkwürdigkeiten Christ-katholisch. Kirche*, vol. v. part 1.

TRINO DA NECESITAS, three species of contributions, to which, in Anglo-Saxon times, all the lands of England, whatever their tenure, not excepting those of the church, were subject; viz., *bryge-bot*, for keeping the bridges and highways in repair; *burg-bot*, for keeping the fortresses in repair; and *fyrð*, for maintaining the military and naval force of the kingdom.

TRIO, in music, a composition for three voices or for three instruments. The same term is also applied to a movement in $\frac{3}{4}$ time in a different key, which follows a minuet

or other movement, and always leads back to the previous movement in the original key.

TRIPE. A term originally applied to the entrails in general; but in gastronomy used of the large stomach of any ruminating animal when prepared for food.

TRIPE DE ROCHE, a name originally given by the Canadian hunters to certain lichens, species of *gyrophora*, which they are often forced to use as food, and now very generally in use as the designation of these plants. They are nutritious, but bitter, nauseous, and purgative. They have a leafy peltate thallus, variously lobed and notched—in *G. proboscidea* of a smoky-brown color, and in *G. erosa* almost black; the shields are round, without stalks, covered with a black membrane, and marked with circles and plaits upon the surface. These lichens grow on rocks in northern regions or on high mountains. See *illus., Mosses, ETC., vol. X.*

TRIPIT'AKA. See **PIT'AKA.**

TRIPLE ALLIANCE, the name by which three different treaties are known in history; viz., 1. A treaty concluded in 1668 at the Hague between England, Holland, and Sweden, having for its object the protection of the Spanish Netherlands, and the checking of the conquests of Louis XIV. 2. An alliance concluded in 1717 between Britain, France, and Holland against Spain, which included among its stipulations that the pretender should quit France, and that the treaty of Utrecht should be carried into effect as regards the demolition of Dunkirk. The Protestant succession was guaranteed by this treaty in England, and that of the duke of Orleans in France. 3. The so-called *Dreibund* or *Dreikaiserbund* between Germany, Austria, and Italy. It was originally a dual alliance between Germany and Austria alone and was first formed Oct. 7th, 1879, as a safeguard for the two empires against the possible designs of Russia and France. The original compact was to run for five years, as was the second union formed in 1882, in which year Italy entered the alliance in spite of the opposition of republicans and Irredentists (see **IRREDENTISM**). It had been supposed that on the death of Signor Depretis, Italy's policy would be so changed as to lead to the severance of the Austro-German league; but Signor Crispi, who succeeded Depretis, even strengthened the alliance, and again on Crispi's fall from power in 1891, the Marquis di Rudini adhered to the *Dreibund* as being a guarantee of European peace. In July, 1891, the Emperor of Germany publicly stated that the alliance had been again renewed and for a period of six years. The general agreement of the three nations is to combine for mutual defense in case either of them is attacked by any two powers, and to guarantee the integrity of each other's territory. At the same time, a semi-official statement was made, that England had agreed to aid the objects for which the *Dreibund* was formed, by undertaking to aid Italy in case of a naval attack by France.

TRIPLET, in music. When a note is divided into three in place of two parts, as when a minim is divided into three crotchets, a crotchet into three quavers, etc., the group is called a triplet, and it is usual to place the figure 3 over it. Thus—



TRIPOD (Lat. *tripos*, Gr. *tripous*, three-footed), any article of furniture supported on three feet. Three-legged caldrons and bronze altars more especially came under this denomination in classical times; many of them are of exquisite workmanship, and richly decorated. The sacrificial tripod in its earliest form resembled the caldron, with the addition of three rings at the top to serve as handles. Of this description seems to have been the tripod at Delphi, from which the Pythian priestess delivered her oracles, with the addition, however, of a round flat plate on the top, on which the priestess sat while giving the response, while a laurel wreath lay on it at other times. Tripods of a similar form were given as prizes at the Pythian games; and at Athens, a tripod was considered an appropriate reward for a successful choragus. Some beautiful tripods were found at Pompeii; and there are several very interesting specimens in the British museum. Analogous to the classic tripod is Thor's *kettle* in Scandinavian mythology, which was probably the origin of the witches' caldron.

TRIPOLI, a mineral substance employed in polishing metals, marble, glass, etc., so named because it was originally brought from Tripoli in Africa. It is a siliceous rock, composed of very minute particles, somewhat loosely held together, so as to yield readily to the nail, and to crumble down in water like rotten-stone. It has a coarse, dull, earthy fracture, is rough to the touch, and is of a gray, yellow, or red color. The particles which entirely compose it are the siliceous frustules of *diatomaceæ*, which occur unaltered in it, and are united together without any visible cement. Ehrenberg estimated that every cubic inch of bilin tripoli weighing 220 grains, contained 41,000,000,000 of these minute water weeds. Deposits of tripoli occur in the tertiary rocks in every quarter of the world.

TRIPOLI, one of the 38 vilayets or provinces of Turkey, n. Africa, is bounded on the w. by Tunis, on the s. by the Libyan desert and Fezzan, on the e.—if we include the plateau of Barca (q.v.)—by Egypt, and on the n. by the Mediterranean. Area roughly estimated at 200,000 sq.m.; pop. uncertain, but believed to be about 800,000. Tripoli is less mountainous than the rest of Barbary, the Atlas range terminating here in a couple of chains running parallel to the coast, and never exceeding 4000 ft. in height. There are no rivers in the country, and rain seldom falls during the long hot summers, but the dew is copious, and supports vegetation in favored spots. The coast region (about 1100 m. in length) is very fertile about Tripoli and Mesurata, where all sorts of tropical fruits, grain, wine, cotton, madder, etc., are produced; but further e., along the shores of the gulf of Sidra, sandy desolation reigns. The interior yields senna, dates, and galls; the carob and lotus are indigenous. Sheep and cattle are reared in great numbers, and Tripoli is also noted for its small but excellent horses, and its strong and beautiful mules. The commerce of the country consists in exporting, principally to Malta, and the Levant, the products of the country and of the interior of Africa (gold-dust, ivory, natron), which are brought hither in caravans across the desert. The imports (which consist chiefly of European manufactures) have been declining gradually of late years, owing mainly to two causes. The *first* is the new direction which the trade of central Africa is assuming. By the Niger and its great tributary—the Benue—European manufactures are more rapidly and more economically conveyed to the northern intertropical regions than by the tedious overland route of the great Sahara. The *second* cause is the abolition of the slave-trade, which, of course, has stopped the demand for all the commodities that alimented the traffic.

The industry is not important but includes the manufacture of woolen and cotton cloths, mats, leather goods and essences of roses, jasmynes and geraniums. The Bedouins are largely engaged in the rearing of cattle. The Moors, for the most part, conduct the caravan trade. Commerce consists chiefly of a carrying trade to and from the Sudan, the imports being meal, grain, tobacco, cotton and woolen goods, colonial wares, etc., and the exports ostrich feathers, cattle, sponges, and ivory. The trade with foreign nations goes through the ports of Tripoli and Benghazi, while Murzuk is an important center for the inland traffic. Formerly the slave-trade was active, but efforts to suppress it have been partly successful and now a comparatively small number of slaves are brought to the coast. The natives of the cities are chiefly Moors, while the country districts are peopled largely by Arabs, Berbers and Negroes. All of these races profess Mohammedanism. It is estimated that the Jews in the country number 10,000 and there are some Europeans in the city of Tripoli.

In ancient times Tropoli (when we first read of it) appears to have formed the most westerly portion of the territory of Cyrenaica (Barca), or at least to have been tributary to the Cyrenæans, from whom, however, it was wrested by the Carthaginians. It next passed to the Romans, who included it within the province of Africa, and gave it the name of *Regio Syrtica*. About the beginning of the 3d c. A.D. it became known as the *Regio Tripolitana* (on account of its three principal cities, Cæa, Sabrata, and Leptis, which were leagued together; whence its present name Tripoli), and was probably raised to the rank of a separate province by Septimius Severus, who was a native of Leptis. Like the rest of n. Africa, it was conquered by the Arabs (see BARBARY), and the feeble Christianity of the natives was supplanted by a vigorous and fanatical Mohammedanism. In 1552 the Turks got possession of it, and have ever since been the rulers of the country, though the authority of the sultan, up till 1835, had been virtually at zero for more than a century. In that year, however, an expedition was dispatched from Constantinople; the ruling dey—Karamanli—in whose family the sovereignty had continued uninterrupted since 1714) was overthrown and imprisoned; a new Turkish pasha, with vice-regal powers, was appointed, and the state made a vilayet of the Ottoman empire. Several rebellions have since taken place (notably in 1842 and 1844), but they have always been suppressed. See *illus.*, AFRICA, Vol. I.

TRIPOLI, called by the Turks *Tarabûlûs*, and probably the *Cæa* of antiquity, the capital of the foregoing state, lies on a bit of rocky land projecting into the Mediterranean, and forming a bay in lat. 32° 54' n., 13° 11' e. It is surrounded by high walls, with bastions, and is irregularly built, but has beautiful gardens. Pop. 20,000–30,000. Though the majority are Moslems, nearly all the trade is in the hands of Jews and Christians. The overland trade to Sudan has greatly fallen off.

TRIPOLI, *Tarabûlûs*, a sea-port of Syria, is 40 m. n.n.e. of Beyrout. The houses are mostly of stone. In and around the town are many remains of antiquity and traces of middle-age architecture. Originally an important maritime city of Phenicia, the ancient *Tripolis* was besieged and taken by the crusaders in 1109. The harbor is small and shallow. Much fruit is exported; also oil, grain, silk, tobacco, and sponges. Pop. (chiefly Greek), about 17,000.

TRIP'OLI, or **TRIPOLIS** (in its modern Arabic form, *Tarâbulus*), the ancient *Tripolis*, a sea-port, and one of the chief commercial towns of Asia Minor, is situated near the coast, in the vilayet of Trebizond and 48 m. w. of Trebizond, on the eastern border of a small triangular plain running out into the Mediterranean, and on both sides of the river Kadisha. The town is substantially built of stone, with many remains of mediæval architecture, and is supplied with excellent water by an aqueduct. It is surrounded by

gardens of orange, lemon, mulberry, apricot, and other fruit trees, which are planted also in the town itself, and give the place a rich and picturesque appearance; but the low marshy neighborhood renders the place unhealthy. On the left side of the river stands the castle built by count Raymond of Toulouse, in the 12th c. when the city was taken by the crusaders. At the n.w. apex of the plain already mentioned lies the port of Tripoli, called El-Mina (the landing-place), or the Marina, a small fishing-village about $1\frac{1}{2}$ m. distant from the town. The harbor—like other harbors on the Syrian coast, scarcely deserving of the name—is formed by a line of low rocky islets stretching n.w. from the point. The trade of the place has of late much declined, being superseded by that of Beirût; its exports now consist chiefly of silk, sponges, and tobacco; there are also manufactures of soap. Pop. stated at 8000, and consisting of Mohammedans and Greek Christians. It is the see of a Greek bishop.

The ancient city of Tripoli was situated on the plain where immense numbers of granite shafts and other relics of antiquity are still found. Its name (the *Three Cities*, or the *Triple City*) was derived from the circumstance of its being founded by the cities of Tyre, Sidon, and Aradus, as an entrepôt for trade, and a point of federal union. It was for many centuries a place of great commercial importance.

TRIPOLIT'ZA ("three cities"), a t. of Greece, under the Turkish rule, capital of the Morea, now the chief town of the government of Mantinea, lies 22 m. s.w. of Argos. It derives its name from being near the sites of the three ancient cities, Tegea, Mantinea, and Pallantium. In 1821 it was stormed by the Greek insurgents; and in 1828 razed to the ground by the troops of Ibrahim Pasha; it has since, however, been rebuilt. Previous to 1821 it had 20,000 inhabitants; the pop. in '89 was 10,057.

TRIPP, a co. in S. Dakota, bordering on Nebraska, formed, 1873; 1800 sq. m.; pop. not given in census of '90.

TRIP PANT, in heraldry, a term analogous to passant (q.v.), but applied to animals of chase.

TRIPTOLEMUS, in Greek legend, the son of Celeus, king of Eleusis. Ceres taught him to plant corn and make bread, and he introduced agriculture into Attica. Ceres also gave him her chariot drawn by dragons, and he went over the earth feeding the inhabitants and teaching them agriculture. On his return to Eleusis he began festivals in her honor. He was worshiped with divine honors after his death.

TRIPTYCH (Gr. *tris*, thrice, and *ptycho*, I fold), a set of tablets consisting of three leaves, each painted with a distinct subject, but joined together by hinges, and capable of being folded so as to present a new face. The general character of such tablets has been explained under diptych (q.v.), the difference of name, "triptych," "polyptych," being taken from the number of the leaves. In ecclesiastical use, the diptych has been already explained as commonly meaning rather the register of names inscribed on the tablets than the tablets themselves. The triptych, on the contrary, generally speaking, contained sacred pictorial representations rather than written registers or records.

TRIQUETI, HENRI, Baron de (1802-1874), b. at Conflans, Loiret, France, painter and sculptor; studied at the Paris academy of art, and later, finding that he possessed a greater talent for sculpture than for painting, devoted himself to the former. He worked for some time on the interior decoration of the Madeleine. The best known of his works are *Dante, Jesus Feeding the Birds, The Holy Family, and Bacchus*.

TRI'REME (from *tres*, three, and *remus*, an oar) is the designation given in ancient times to a galley having three banks of oars. It is said to have been first employed by the Corinthians in their war with Corcyra, 664 B.C. In the Persian and Peloponnesian wars, triremes were the largest vessels employed; but at the time of Alexander, we find that galleys with four and five banks had gradually come into favor. In the Punic wars, the Carthaginians generally employed quinqueremes; and as the Roman triremes could have no chance against vessels with such high bulwarks, the Romans henceforth constructed their war-vessels after the model of the Carthaginian quinquereme.

The banks of oars were elevated above each other, but not perpendicularly; and the lowest rank of rowers having the shortest oars and easiest work, had the least pay. The trireme or quinquereme was also provided with a square sail, which was used when the wind was favorable for voyaging, to relieve the labor of the rowers, but it was not employed in action. The crew consisted of about 200 men; and on a smooth sea, in speed and accuracy of maneuvering, the trireme was little inferior to a modern steamboat. In the earlier times, before the Persian war, and even later, victory depended more upon the number and valor of the soldiers on board, than upon the skill of the seamen. Herodotus mentions that besides the crew there were 40 marines serving on board each Ionian trireme. The Athenians improved this system by decreasing the number of fighting men, and trusting more to the skillful management of their vessels. In a fight, the aim of each trireme was not as before, to grapple with its opponent, but to dash with the greatest momentum possible with its beak against the enemy's vessel, and strike it amidship, or, at any rate, disable his banks of oars on one side. Fighting men were not so much wanted for these tactics; and so we find later on, in the Peloponnesian wars, the number of marines in each ship reduced to ten. It is singular to see this system of ram-fighting coming once more into vogue. A contrivance for strengthening the prow of the trireme, and increasing its efficiency as a ram, gave the Syracusans their final victory over the Athenians in the harbor of Syracuse.

TRISA'GION, or **TRISHAGION** (Gr. *tris.*, thrice, and *hagios*, holy; Lat. *tersanctus*, thrice holy), one of the doxologies in use in the Greek church, which is repeated in the form of versicle and responses by the choir in certain parts of the liturgy. The words of the trisagion are: "*Hagios O Theos, Hagios Ischuros, Hagios Athanatos, eleison hemas!*" (O Holy God, O Holy Mighty One, O Holy Immortal, have mercy on us!) This doxology, in its original Greek form, is one of the few fragments of the Greek liturgy which (like the *Kyrie Eleison*) are retained in the original language in the Roman mass. It occurs in the service of Good Friday in the procession and veneration of the cross. See **GOOD FRIDAY**.

TRISMEGISTUS (Gr. thrice-greatest), an epithet applied to the Egyptian Hermes (q.v.), or Thoth (q.v.), by the Neoplatonists and the devotees of magic, alchemy, and mysticism generally, who looked upon him as the source of all mysterious doctrines. See **HERMETIC BOOKS**.

TRISMUS NASCENTIUM is a form of lockjaw occurring in newly born children, in consequence mainly of impurity of the atmosphere. In Iceland, this disease annually carries off a large proportion of infants between the fifth and twelfth days after birth; in some parts the mortality being nearly *two out of three*. It is also very frequent and fatal in the West Indies, where it is known as the "ninth-day disease." Another of its names is "the jaw fall," from the circumstance of the jaw relaxing and dropping on the breast shortly before death. The complaint used to be common in hospitals when ventilation was less attended to than at present; but with the introduction of a better system of ventilation, the mortality has been very much reduced."

TRISSINO, **GIANGIORGIO** (1478-1550), b. at Vicenza, Italy, a noted poet and scholar; he went to Rome when twenty-four years of age and was received by Leo X. There he published *Epistola a Clementi VII.*, *Canzone a Clemente VII.*, the *Sofonisba* (a drama), and the *Ritratti*. A ban of exile which had been placed upon him in 1508 was removed. Among his other works are *Alfabeto*, the *Grammatices Introductionis Liber Primus* (1540), the *Italia liberata dai Gata* (1548), and *I Simillimi* (a comedy).

TRISTAN DA CUNHA, an island in the s. Atlantic ocean, lies midway between the coast of South America and the cape of Good Hope, in 37° 3' s. lat., long. 12° 18' w. In 1816 a company of British artillery was stationed on the island for the purpose of keeping a watch on Napoleon, at that time a prisoner in St. Helena, from which Tristan da Cunha is distant about 1300 miles. On the death of Napoleon in 1821, the soldiers were withdrawn, with the exception of a corporal named Glass, and one or two companions, who were left in charge of the small fort that had been erected. These men finding the soil very fertile, proceeded to cultivate the island, and their efforts were attended with marked success; inasmuch that they were enabled to carry on a brisk trade in the produce with any passing ships that might stand in need of fresh provisions. The colony flourished, and in 1829 numbered 27 souls. When visited by H.M.S. *Challenger* in Oct., 1873, the place was found to be still thriving; the inhabitants numbered 80, and the cattle had increased to 600, with an equal number of sheep. In the vicinity of Tristan da Cunha are two other islands—one of them, Inaccessible Island, 20 m. distant, possessing a special interest from the circumstance of its having harbored two Germans of the name of Stoltenhoff, who underwent a kind of Robinson Crusoe experience there. They were landed on this desolate island Nov. 27, 1871, when making their way to the larger island of Tristan da Cunha, and determining to settle there, experienced many privations, being sometimes reduced to great extremities; though, unlike Robinson Crusoe, he had more than one opportunity of quitting the island in the course of their two years' sojourn. They were at length, however, fain to take advantage of the opportunity afforded them by the *Challenger* of leaving the island, which they accordingly did on Oct. 16, 1873. Pop. '93, 52.

TRISTRAM is the hero of a British legend, which originally had no connection with the stories of king Arthur and the round table, although later minstrels sought to interweave them. Briefly, the legend goes as follows:

Tristram, son of Rouland Rise, lord of Ermonie, and Blanche Fleur, sister of Mark, king of Cornwall, having lost both parents at the period of his birth, is brought up for the first 15 years of his life at the court of the monarch who had slain his father, after which he proceeds to Cornwall, and is acknowledged by his uncle, who appoints him his heir and successor. Having received a severe wound in a duel, he is cured by Ysolt or Ysonde, daughter of the queen of Ireland; and, on his return to Cornwall, informs his uncle of the marvelous beauty of the Irish princess. Mark is charmed, and sends his nephew to Dublin, at the head of a select body of knights, to solicit her hand in marriage. The king's suit is successful, and Tristram escorts her on her voyage to England, but both having unwittingly partaken of a love-potion (which was intended for Mark), they are immediately inflamed with a criminal passion for each other, which is the source of all their subsequent misfortunes. Ysolt is married to the king of Cornwall; but, by the help of her clever maid, Brenkwain, she contrives to have numerous secret interviews with her lover, and for some years succeeds in allaying the jealousy and suspicions of her husband. At last, however, Tristram is banished from Cornwall, and goes to Wales, where he performs prodigies of valor. His uncle again becomes reconciled to

him, and invites him back to his court, where the amours of the incorrigible lovers are renewed. A renewed banishment is the consequence, and Tristram goes abroad to Spain, Ermonie, Brittany, in the last of which countries he marries another Ysolt, called, for distinction's sake, Ysolt *with the white hand*, daughter of the duke of Brittany. In one of his exploits he is desperately wounded, and can only be cured by Ysolt of Cornwall. He dispatches a messenger to the princess, telling him that on his return he is to hoist a white sail as he approaches the coast of Brittany, if Ysolt accompanies him; but if not, a black sail. The queen of Cornwall hastens to save her lover; and as the vessel nears the shores of France, Tristram's wife, Ysolt *with the white hand*, recognizes the white sail, and, fired with jealous hate at the thought of a rival's approach, hurries to her husband's chamber, and tells him the messenger's ship is coming in with black sails spread. Tristram, in an agony of disappointed love, sinks back and expires. When the queen of Cornwall lands, and hears of his death, she rushes to the castle, throws herself on his corpse, and dies beside him. King Mark subsequently learns the story of the love-potion, and buries the twain in one grave, planting over Ysolt a rose-bush, and over Tristram a vine, which grew up so inextricably intertwined that no man could ever separate them.

The popularity of the story in the middle ages was unbounded. The scene of the principal exploits, and the residence of the principal personages, is Cornwall, from which one is disposed to claim a British or Welsh paternity both for the legend and the literature; and this is the view that underlies sir Walter Scott's argument in behalf of the purity of the metrical version of *Sir Tristram* which he published (ed. 1806) from the Auchinleck MS., and which is considered to be the composition of Thomas the Rhymer (q.v.). As early as the middle of the 12th c., however, the legend had become a favorite throughout the whole of France; and it subsequently found its way into Spanish, Italian, German, Scandinavian, Slavic, and Greek literature. *Tristan und Isolde* is the subject of one of Wagner's operas. See Michel's *Tristan* (1835), and Bossat's (1865).

TRITICUM. See WHEAT and COUCH GRASS.

TRITON, in Greek mythology, a son of Poseidon and Amphitrite, who dwells with his parents in a golden palace at the bottom of the sea. He usually figures as an attendant on his father, riding over the Mediterranean on a horse or other sea-monster, and soothing the turbulent waves by blowing his shell-trumpet—his "wreathed horn," as Wordsworth calls it. The later poets speak of Tritons, in the plural, as a race of subordinate sea-deities, who are described by Pausanias as having sea-green hair and eyes, gills below the ears, human noses, broad mouths with the teeth of animals, scales on their bodies, and, instead of feet, a tail like that of a dolphin. They were frequently represented in works of art. See *illus.*, MYTHOLOGY, vol. X.

TRITON, a genus of water-salamanders belonging to the second section of the order *urodela*. The land-salamanders also belong to this section. The tritons, water-salamanders, or newts, are distinguished from the land-salamanders by having a compressed, fish-like tail, and by being strictly oviparous. The larvæ are tadpole-like, having external branchiæ which they retain till about the third month. The adults are without gills, breathing wholly by lungs, but they retain the larval tail throughout life. The tongue is small, free, and pointed behind, and there are two rows of palatine teeth; fore-feet 4-toed, hind-feet 5-toed. The males have a crest on the back and tail. The development of the newts is much like that of the frogs, with the following two points of difference: 1. The embryonic tail is not cast off in the adult; 2. The fore-limbs appear externally sooner than the hind-limbs. The name triton is also applied to several univalve mollusk shells, commonly called conch-shells.

TRIUMPH (Lat. *triumphus*) was the name given in ancient Rome to the public honor bestowed on a general who had been successful in war. It consisted in a solemn procession along the *Via Sacra* up to the capitol, where sacrifice was offered to Jupiter. The victor sat in a chariot, drawn by four horses—his captives marching before, his troops following behind. Certain conditions had to be fulfilled before a triumph could be enjoyed, and it was the business of the senate to see that these were enforced. Under the empire generals serving abroad were considered to be the emperor's lieutenants, and, therefore, however successful in their wars, they had no claim to a triumph. They received instead *triumphal decorations* and other rewards.

The appearance that Rome presented on the occasion of a triumph, especially in later times, was joyous in the extreme. All work was suspended; the temples were thrown open, and decorated with flowers; the populace were clad in holiday attire, and crowded the steps of all the public buildings in the *Via Sacra*, and the forum, or mounted the scaffoldings erected for the purpose of viewing the procession; banquets were spread before every door. As for the *imperator* himself, after having pronounced a eulogy on the bravery of his soldiers, he ascended his triumphal car, entered the city by the *porta triumphalis*, where he was met by the senate, and now the procession began. First marched the senate, headed by the magistrates; next came a body of trumpeters; then a train of carriages and frames laden with the spoils of the vanquished; then a body of flute-players, followed by the oxen doomed to be sacrificed, and the sacrificing priests, etc.; then the distinguished captives with bands of inferior prisoners

in chains; after whom walked the lictors of the emperor, having the fasces wreathed with laurel. Next came the hero of the day—the emperor—in a circular chariot, attired in an embroidered robe (*toga picta*) and flowered tunic (*tunica palmata*), bearing in his right hand a laurel bough, in his left, a scepter, and having his brows garlanded with Delphic laurel. He was accompanied by his children and his intimate friends. His grown-up sons, the legates, tribunes, and equites, rode behind; and the rear was brought up by the rest of the soldiery, singing or jesting at their pleasure, for it was a day of carnival and license. When the procession had reached the capitoline some of the captive chiefs were taken aside and put to death; the oxen were then sacrificed, and the laurel wreath placed in the lap of Jupiter. In the evening the emperor was publicly feasted, and it was even customary to provide him a site for a house at the public expense.

The *ovation*, or lesser triumph, differed from the greater chiefly in these respects: that the emperor entered the city on foot, clad in the simple *toga prætexta* of a magistrate; that he bore no scepter, was not preceded by the senate and a flourish of trumpets, nor followed by his victorious troops, but only by the equites and the populace, and that the ceremonies were concluded by the sacrifice of a sheep instead of a bull, whence, doubtless, the name *ovation* (from *ovis*, a sheep).

TRIUM VIRATE (Lat. a union composed of *three* men) is the name given in Roman history to the private league entered into between Pompey, Crassus, and Cæsar—the three most powerful men of their time; the object of which was to carry out their own schemes of political aggrandizement, in spite of the opposition of the senate. This compact was not a triumvirate, in the proper sense of the term: it had no legally constituted existence: it was, in fact, only a treasonable conspiracy of three men against the legitimate authority of the state. The term is less incorrectly applied to the division of government between Octavian (Augustus), Mark Antony, and Lepidus in the civil wars that followed the murder of Cæsar—an arrangement sanctioned, and, therefore, legalized by the senate. The former is usually called the *first*, the latter the *second* triumvirate.

TRIVIUM, Three Roads, the name given to the lower section of the seven liberal arts (see **ART**), constituting the circle of study in the middle ages. It embraced grammar, logic, and rhetoric.

TROCHA. A Spanish military term denoting a fortified line of considerable length defended by stockades, earthworks, and occasional small forts.

TROCHIDÆ, a family of gasteropodous mollusks, of the order *pectinibranchiata*, section *asiphonata*. The shell has the aperture entire, closed with an operculum; spiral, and very generally top-shaped, as in the genus *trochus*, the species of which are popularly known as top-shells. The species are very numerous, and widely distributed. They feed on sea-weeds, and some of them are found on rocks between high and low water mark. Many of them are very beautiful, and some of the small kinds are often employed to adorn head-dresses, and for other ornamental purposes, the epidermis and outer layer being removed. Several species are frequent on the British shores. Some of the tropical ones attain a comparatively large size. The trochidæ are very closely allied to *turbinidæ*.

TROCHILUS AND **TROCHILIDÆ**. See HUMMING-BIRD.

TROCHU, LOUIS JULES, b. France, 1815; received his education at the military academy of St. Cyr, and in 1837 entered an artillery regiment as lieutenant. He fought in the Crimean war, was made a general of division, and in this capacity received a command in the Italian campaign of 1859. In the crisis which followed the battle of Sedan, during the Franco-German war of 1870–71, Gen. Trochu was made governor of Paris and commander-in-chief of all the forces destined for the defense of the capital, which position he held until the city surrendered. In Oct., 1871, he was elected president of the council-general for Morbihan, but he afterward resigned that post, and lived in retirement since 1873. His pamphlet on *L'Armée Française en 1867*, reached its 20th edition in 1870. In 1873 he published *Pour la Vérité et pour la Justice*, in justification of the government of the national defense. He died Oct. 7, 1896.

TRÆZEN, or **TRÆZENNE**, an ancient city in s.e. Argolis, Greece. It was supposed to have been founded by Ionians, and is mentioned by Homer. After the Dorian invasion of the Peloponnesus it became a Doric city. After Thermopylæ the Greek naval forces met at Træzen and were aided by the people of that place, who sent 1000 men and five ships to Artimisius and Salamis. In the Peloponnesian wars the city sided with the Spartans, and later came under the rule of Macedonia. The city is described by Pausanias as flourishing in the 2d c. of our era.

TROGLODYTES (Gr. *Trōglodytai*—Gr. *trōgle*, a hole, and *dyo*, to get into; hence cave-dweller), the name given by the ancient Greeks to various tribes or races of uncivilized men, who dwelt either in natural caverns, or in holes which they had dug for themselves in the earth. They are mentioned by Strabo as existing as far w. as Mauretania, and as far e. as the Caucasus; but perhaps the best-known troglodytes of ancient times were those of southern Egypt and Æthiopia, where a considerable district of country was called *Regio Troglodytica*. They could not speak articulately, but shrieked or screamed like the lower animals; though it ought always to be remembered that the Greeks, from

whom we have such statements, are not very trustworthy authorities in the matter of language, accounting every dialect which they did not understand a barbarous jargon. The chief occupation of the troglodytes was herding cattle, though we also read that they were hunters and robbers. They are likewise mentioned as serving among the light troops in the army of Xerxes. Their habits of life were rude and debased; they are reported to have eaten not only the flesh, but the bones and hides of their cattle; their drink is said to have been a mixture of milk and blood; and they had a community of wives. The wives tattooed their bodies; and the men, if not clothed in cattle-skins, went about *in puris naturalibus*. But the most revolting and unnatural of their practices was their treatment of the dead. They are reported to have bound the corpse neck and heels together, affixed it to a stake, pelted it with stones, amid shouts of laughter; and buried it beneath a cairn of missiles.

TROGONIDÆ, a family of birds, ranked by some naturalists, on account of their habits, in the order *insectivores*, and tribe *fissirostres*; but more generally, on account of the formation of the feet—two toes before, and two behind—placed in the order *scansores*. The trogonidæ are remarkable for the beauty of their plumage, which is soft, full, and brightly colored. The bill is short, strong, with a wide gape; the tail generally long, in some species very long; the feet small, and in many, feathered almost to the toes. All the trogonidæ are tropical: they belong chiefly to the south-eastern parts of Asia, the Indian archipelago, and South America. They abound most of all in South America. See *illus.*, LARKS, ETC., vol. VIII.

TROIZK, a t. of e. Russia, on the border of Siberia, in the government of Orenburg, stands on the Oug, 420 m. s.w. of Tobolsk. It is the seat of considerable commerce, especially during the summer months, at which season a large trade is carried on with the Kirghis and the Bokharians. Pop. '93, 20,871.

TROLLEY. A word first coined in England, and there used in the sense of a hand-cart, and then of a truck. In the United States it means a sort of pulley in contact with an overhead wire, and connected with a rod or flexible conductor, by which an electric current is transmitted to the motor of a street-car. The word is from a Celtic root meaning to roll or turn.

TROLLOPE, ANTHONY, second son of Mrs. Frances Trollope, and one of the most popular novelists of his day, was b. in 1815. He was educated at Winchester, and subsequently Harrow. While filling a responsible official situation in the post-office, he obtained, or made, leisure to amuse the public with a long series of novels, of very remarkable merit. The first work which decisively drew attention, *The Warden*, was followed by a continuation, *Barchester Towers*, which remains, perhaps, the cleverest of all his books. In rapid succession to these, came *Doctor Thorne*, *The Bertrams*, *The Three Clerks*, *Castle Richmond*, *Framley Parsonage* (originally published in the *Cornhill Magazine*), *The Kellys* and the *O'Kellys*, *Orley Farm*, *The Small House at Allington* (contributed to the *Cornhill Magazine*), *Rachel Ray*, *Miss Mackenzie*, *Can You Forgive Her*, *Ralph the Heir*, *Phineas Finn*, *Phineas Redux*, and other works. Besides these, Trollope published several pleasant volumes of travels about *The West Indies* and *the Spanish Main*, on *North America*, on *Australia*, and on *South Africa* (1878), a life of *Cicero* (1881), sketches of Thackeray (1879), and Palmerston (1882). He d. 1882. He does not go very deep; but he sketches the superficial aspects of society with a charming lightness and facility of touch, and is unfailingly agreeable and amusing. His autobiography appeared after his death. See the sketch by Henry James in *Partial Portraits*.

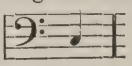
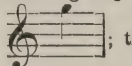
TROLLOPE, MRS. FRANCES, a novelist and miscellaneous writer of some eminence, was b. in the year 1780. Her father was an English clergyman. In 1809 she was married to Mr. Anthony Trollope, a barrister-at-law. In 1829 she went to America; and during a three-years' residence in the United States, amassed the materials of her first book, *Domestic Life of the Americans*, published in 1832. This work attracted great attention; and the severity of certain of its strictures was much resented by the sensitive inhabitants of this country. It was republished in 1896 with an introduction by H. T. Peck. From this time forward, the literary activity of Mrs. Trollope was nearly uninterrupted, and her name became one of the more notable of the time. Novels of society and impressions of travel make up the sum of her works. Of her novels, the most successful is, perhaps, *The Widow Barnaby* (3 vols., 1839); with its sequel, *The Widow Married* (3 vols., 1840); followed by *The Barnabys in America*, or *Adventures of the Widow Married*. Mrs. Trollope was a woman of strong talent, and her works are full of shrewd observation, and true, if at times somewhat coarse, humor. They were popular in their day, and very well deserved their popularity; but already they are well-nigh forgotten. No list of them in detail seems needed. During the life of her husband, Mrs. Trollope resided chiefly at Harrow. During her later years, much of her time was passed in Italy, where her eldest son, Thomas Adolphus, had taken up his abode. She died at Florence, Oct. 6, 1863.

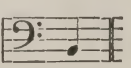
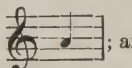
TROLLOPE, THOMAS ADOLPHUS, English *littérateur*, b. April 29, 1810, was the son of Mr. T. A. Trollope and Frances Trollope, the well-known English authoress, and brother of Anthony Trollope, the English novelist. He was educated at Winchester, Eng., and at Alban hall, Oxford. He published two volumes upon Brittany about the year 1840, and they were followed by two on Western France, in 1841. Then he took up his residence in Florence, Italy, and produced a series of works connected with the history of that country. *Impressions of a Wanderer in Italy* appeared in 1850;

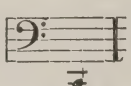
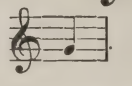
Girlhood of Catherine de' Medici, a Tale; A Decade of Italian Women, and Tuscany in 1849, in 1859; *Filippo Strozzi, a History of the Last Days of Old Italian Liberty*, and a volume entitled *Paul V. the Pope and Paul the Friar*, in 1860, with *Lenten Journey in Umbria and The Marches*, in 1862; *History of the Commonwealth of Florence to the Fall of the Republic in 1831*, 4 vols., was published in 1865, and *The Story of the Life of Pius IX.*, in 1877. He wrote novels also, with Trollopean fecundity, eleven being catalogued up to the year 1887. He died Nov. 11, 1892.

TROLLS, in mythology, misshapen dwarfs, inhabiting hills and mounds, having abnormal thieving propensities; stealing children and substituting their own offspring for them. They were peculiarly sensitive to noise, which was their especial aversion, reminding them of the hammer of Thor, which he was accustomed to throw after them. They were called the hill-people. Though strong, they were easily outwitted by men.

TROMBONE (Ital. great trumpet), a large, deep-toned brass instrument, of the trumpet species, but consisting of two separate parts, so constructed that the two ends of one fit into those of the other, and consequently, by sliding the one part in or out, the tube through which the air passes may be shortened or lengthened, and the pitch changed at pleasure. Three kinds of trombone are in general use, differing in pitch; the *alto trom-*

bone, with a compass extending from  to ; the *tenor trombone*,

with a compass from  to ; and the *bass trombone*, whose compass

extends from  to . The music for these instruments is written

on the alto, tenor, and bass clefs respectively. There is also a *double-bass* trombone, which is but rarely used. The trombone, if judiciously employed, is a very effective instrument in an orchestra—the tone is grander and more powerful than that of the trumpet.

TROMP, a blowing-machine actuated by a current of falling water. It is used in mountainous districts for supplying air to furnaces. A large pipe, usually about 2 ft. in diameter, leads from an upper reservoir of water to a cistern 25 or 30 ft. below it. A few feet beneath the reservoir the pipe is contracted to a funnel shape, and immediately below this, where it widens, there are a number of holes for the admission of air, which rushes in to supply the partial vacuum created by the descending water, which, together with the air, is carried to the lower cistern, where separation is effected, the water passing out at the bottom and the air out at the top, at a pressure regulated by the rate of exit of the water.

TROMP, CORNELIS, 1629–91; b. Rotterdam, Holland; son of Martin Harpertzoon. When but 21 years old he was made a vice-admiral, as a reward for his success in fighting African pirates and the English. In 1666 he fought with distinction in the first battle with the English, but in the contest of July 25 his conduct did not meet with De Ruyter's approval, and he was removed. In the war of 1673 he again served with distinction; and, after De Ruyter's death, succeeded him in command. He was afterward at the head of the Danish navy.

TROMP, MARTIN HARPETZOOM, a celebrated Dutch admiral, was b. at the Briel in 1597. When a boy he went to sea with his father, a commander in the Dutch navy. In an engagement off the coast of Guinea with an English cruiser, his father was killed, and young Tromp made prisoner. His captors compelled him to serve as a cabin-boy for two years and a half, after which his history becomes for some time obscure. In 1622 we find him a lieutenant on board a Dutch ship-of-the-line; and two years afterward prince Maurice gave him command of a frigate. In 1629 the famous Admiral Peter Hein took command of Tromp's ship, and was killed by his side. Disgusted by some real or imaginary slight, Tromp about this time retired from the service. In 1637 he returned, and was created lieutenant-admiral by the stadtholder Frederick Henry. He was appointed to the command of a squadron of eleven ships. He now prosecuted a vigorous naval war against the Spaniards, taking in one celebrated action, fought on Oct. 21, 1639, 13 richly-laden galleons. But the events which were to render the name of Tromp immortal did not occur until the commencement of hostilities between England and Holland in 1652. On May 19 of that year he encountered the English fleet under Admiral Blake. The Dutch were defeated with the loss of two ships-of-war. Tromp was for a while superseded in command by Ruyter and De Witt, but he was soon afterward reinstated. On Nov. 29, same year, he again encountered Blake in the strait of Dover. This time success was decidedly with the Dutch. The English fleet was obliged to retire; and Tromp sailed up the channel with a broom at his masthead, to denote that he had swept his foes from the seas. They were, however, not long in returning. On Feb. 18, 1653, Monk and Deane having been united in command with Blake, they attacked Tromp near Portland, and defeated him, though only after a contest memorable for its obstinacy. It lasted three days, at the close of which Blake had

taken or destroyed 11 ships-of-war and 30 merchantmen, killed 2,000 of the enemy, and captured 1500. On June 2 and 3 following, another terrific battle took place off n. Foreland, in which six Dutch vessels were captured, 11 sunk, and the remainder driven into Calais roads. On July 31 the warfare was again renewed off the coast of Holland. On this occasion the Dutch lost 30 men-of-war, and Admiral Tromp was killed.

Tromp was a thorough seaman, homely in manner, benevolent in disposition, and enthusiastic in his calling. He was buried at Delft, with great pomp and solemnity.

TROMSÖ, a small island on the n.w. coast of Norway, in Finmark, lies between the island Kvalö and the main-land. It is 4 m. long and about 1½ m. broad. On the eastern side of the island is the small but thriving town of the same name, the seat of a bishop. Russian vessels from Archangel and the White sea visit this town, and bring corn, which they exchange for dried fish. Pop. '91, 6080.

TRON, or **TRONE**, weight, the most ancient system of weight used in Scotland, is so called from *trone*, a species of heavy beam or balance set up in the market-place and employed for the weighing of heavy wares. The weights employed in the public markets formed the most convenient reference, and consequently tron weight became the standard. The tron lb. contained 20 oz., but from the custom of giving "one in" to the score, was always reckoned at 21 oz.; this was the most general value; but it varied in the different market-towns between this and 28 oz. The later tron stone or standard weight contains 16 tron lbs., each lb. 16 tron oz., and each tron oz. 16 drops; the tron lb. is estimated to be equivalent to 1.3747 lbs. avoirdupois.

TRONDHEJEM. See **THRONDHEJEM**.

TROON, an important sea-port in the county of Ayr, Scotland, 8 m. s.w. of Kilmarnock, and 6 m. n. of Ayr. The greater part of the town (which is not older than the present century) occupies a bare and level promontory; but along the broad and beautiful strand of Ayr bay, known as the "south beach," stretches, for nearly half a mile, a row of handsome villas and cottages, built chiefly for the accommodation of summer visitors. The place is yearly becoming more attractive as a sea-coast residence, partly on account of its extreme salubrity, and partly on account of the ample scope afforded by its wide stretch of sands for the simple amusements of the sea-shore. The harbor, which occupies the extremity of the promontory, is secure and spacious, and is much frequented. The principal exports are coal and iron, of which Ayrshire yields an abundant supply. Pop. in '91, 3315.

TROOP, in cavalry, the unit of formation, forming the command of a captain, consisting usually of 60 troopers, and corresponding to a company of infantry. The officers of a regular troop are the captain and two lieutenants. Two troops form a squadron.

TROOPIAL, *Molothrus*, a genus of birds of the family *sturnidæ* (see **STARLING**), having a short, thick, conical bill; long, pointed wings; and a slightly rounded tail. The cow troopial (*M. pecoris*), also called cow black-bird, cow-pen bird, etc., is common in North America, passing the winter in southern parts of the continent, and migrating northward in spring. Its plumage is of a shining black color except the head and neck, which are blackish-brown. It is very generally to be seen in attendance on cattle, picking up the insects which they disturb, or which are attracted by their droppings. Like the cuckoo, it makes no nest of its own, but deposits its eggs in the nests of other birds.

TROOST, GERARD, 1776-1850; b. Holland; educated at the university of Leyden; captured by a privateer in 1809, while on his way to Java, on a scientific expedition under the patronage of Louis Bonaparte, king of Holland; he became a resident of Philadelphia, where he founded the Academy of Natural History, of which he was the first president. He was for a time professor of chemistry in the Philadelphia college of pharmacy, and afterward a member of Robert Owen's New Harmony community. In 1827 he became professor of chemistry, geology, and mineralogy in the university of Nashville.

TROPÆOLUM, a genus of plants of the natural order *tropæolaceæ*. This order is allied to *balsaminaceæ* and *geraniaceæ*. The species are not numerous, and are all natives of South America. They are smooth herbaceous plants, somewhat succulent, with an acrid or pungent taste, trailing or twining stems, and alternate simple or divided leaves, destitute of stipules. The species of the genus *tropæolum* form the greatest part of the order, and have usually simple peltate leaves. *T. majus* is the well-known INDIAN CRESS of our gardens, the unripe fruit of which is often used to give pungency to pickles, under the name of *nasturtium*. It is a native of Peru, and has long been much cultivated in the U.S. as an ornamental plant, climbing among bushes or on trellises, and taking hold by the curving stalks of its leaves; its stems from 6 to 10 ft. long, its foliage abundant, and its flowers large, orange, or dark red. The young leaves are used in salads. The Indian cress is really a perennial, although it flowers within a few months from the time of sowing, and in Britain is always treated as an annual, not being able to endure the winter. *T. minus* is very similar, but of weaker growth, and its flowers smaller. *T. peregrinum*, although much more recently introduced into America than the Indian cress, has now become almost equally common, and is a great favorite in flower-gardens. It is popularly called the CANARY PLANT.

Its stems are long and slender, and it speedily covers a high trellis. Several other species are frequent and fine ornaments of gardens and green-houses. The tubers of *T. tuberosum* are eaten in Peru. Their taste is peculiar.

TROPE (Gr. *tropos*, a "change," a "turning") is the name of a figure of speech which does not appear to differ from metaphor (q.v.). See **RHETORIC**, **FIGURES OF**.

TROPHONIUS, in Greek legend, was the most skillful architect of his day, and was the son of Erginus, king of Orchomenus, or of Apollo. Along with his brother, Agamedes, he built the temple of Delphi and the treasury of king Hyrieus in Bœotia, which the two are said afterward to have plundered. After his death he was worshiped as a hero, and had a celebrated oracle at Lebadeia (Livadia) in Bœotia. "The entrance to the oracle was a very narrow aperture on the summit of a mountain, protected by a marble parapet about two cubits in height, and by brazen spikes above it." The votary who wished to enter the "cave of Trophonius," in order to consult the oracle, after preparing himself for several days previously by purification and sacrifice, lay prone on his back, and put his feet into the cave, when he was caught by some unseen force, and violently pulled inside.

TROPHY (Lat. *tropæum*, Gr. *tropaion*, from *trepo*, to put to flight—the letter *h* in the English word being an intrusive letter) was a memorial of victory erected on the spot where the enemy had turned to flight. Among the Greeks (with the exception of the Macedonians, who erected no trophies), one or two shields and helmets of the routed enemy, placed upon the trunk of a tree served as the sign and memorial of victory. After a sea-fight, the trophy consisted of the beaks and stern ornaments of the captured vessels, set up on the nearest coast. It was considered wrong to destroy such a trophy, and equally wrong to repair it, when it had fallen down through time, for animosity ought not to be perpetual. In early times, the Romans never erected trophies on the field, but decorated the buildings at Rome with the spoils of the vanquished. Of this practice, we have a familiar instance in the *rostra* or beaks set up in the forum. In later times, pillars and triumphal arches were employed to commemorate victories. Besides these, in modern times, the humiliation of an enemy is rendered lasting by such devices as the bridge of Jena, of Waterloo, and by the distribution of captured cannon. Morally considered, this practice is no improvement upon the simple and perishable trophies of the ancient Greeks.

TROPIC-BIRD, *Phaeton*, a genus of birds, ranked by some in the family *pelecanidae*, by others in *laridae*. The bill is strong, pointed, and almost arched; the head completely feathered; the wings long; the tail short, except two feathers, which are very long and slender. Only two species are known, both tropical, and often seen very far from land. The **COMMON TROPIC-BIRD** (*P. æthereus*) is about the size of a partridge, white, with curved lines of black on the back; some of the quill-feathers black, tipped with white. It is found in the Atlantic ocean; while in the Indian and Pacific oceans, the other species (*P. phœnicurus*) appears, which is of a pale rose-color, with black wing coverts, and the long feathers of the tail red. The tropic-birds breed on high cliffs.

TROPICS (Gr. turning-points or limits) are two parallels of latitude on the terrestrial globe, passing through the most northerly and southerly points on the earth's surface at which the sun is vertical. On the armillary sphere (q.v.), consequently, the ecliptic (the representation of the sun's path) touches but does not cross the tropics. The tropics include between them all those points on the earth's surface at which the sun is ever vertical. The tropic north of the equator is called the tropic of Cancer, because the sun at the summer solstice (at which time he is vertically over that tropic) enters the constellation of Cancer; and the southern one is, for a similar reason, denominated the tropic of Capricorn. The tropics are not absolutely fixed at a uniform distance from the equator, but the limits of their variation are extremely narrow. For Jan. 1, 1882, the *Nautical Almanac* gives their position in 23° 27' 16.60" n. and s. respectively.

TROP PAU, the capital of Austrian Silesia, on a tributary of the Oder, is a well-built town, 184 m. n.e. of Vienna by railway. It is the seat of the provincial government, and has a castle, cathedral, several palatial buildings, churches, and public schools, a library, a museum of Silesian antiquities, important manufactures of machinery, cottons, linens, liqueurs, and beet-root sugar, and an active transit trade. Pop. '90, 22,867. A diplomatic congress was held here in October and November, 1820, which was subsequently removed to Laibach (q.v.).

TROUBADOUR (Provençal, *trobar*; Fr. *trouver*, to find, of unknown derivation). In Provençal poetry (see **ROMANTIC LANGUAGES**), a troubadour was a polished and cultivated poet—what the Germans call a *Kunstdichter* (art-poet)—who did not make a trade of his muse in opposition to the musician and jongleur, who wandered about the country singing for money. Yet this distinction only gradually showed itself. At first, all classes of the community were nearly equally rude, and what pleased the peasant in the shape of song, pleased the prince also; but by degrees, a superior refinement and sensibility manifested themselves in the tastes and manners of courts, and this superiority found poetical expression in a more artistic kind of verse than had hitherto prevailed. Great nobles, princes, and kings who practised verse-making for their pleasure, or out of chivalrous gallantry, were always called troubadours; while inferior knights, court-attendants (M.

Lat. *ministeriales*; hence *menestrels*, minstrels), and even citizens and serfs who lived by their art, or at least took money for the exercise of it, were sometimes called troubadours, and sometimes jongleurs. Under this last name were classed the musicians, singers, jugglers (a word, in fact, which is only a corruption of *jongleur*), etc.; all, in short, who did not themselves make or invent (*trobar*) poems, but only recited or chanted them, or whose business it was to accompany the singer on some musical instrument. The more celebrated troubadours had one or several such jongleurs in their service, as it was considered *infra dig.* for a poet to be his own fiddler. This new troubadour poetry (*art de trobar*), which it may be remarked was *lyrical*, while the popular minstrelsy was mainly of the *epic ballad* sort, exercised a considerable influence on the advancement of literature and culture generally; yet those who practiced it never formed themselves into a guild, or into special schools, but preserved a certain free individualism, which gives a fine picturesqueness to the outlines of their history. At all the courts (great and small) in s. France, n. Spain, and Italy, they were esteemed a brilliant ornament of society; princes and fair dames (often themselves troubadours, as has been remarked) were proud of their praise, and their service of gallantry, or dreaded the biting railery of their satiric muse; while, on the other hand, the majority of the troubadours gladly attached themselves to the court of a great prince or noble, sometimes praising their master in *sirventes* (service-songs), sometimes censuring him, but at any rate, always selecting some lady as the "mistress of their heart," to whom they, under a general or allegorical name, addressed their love-songs (*cansos*), whose cruelty they bewailed in songs of lamentation (*planes*), or whose death they mourned in sorrowful threnodies. Although the "love-service" of the troubadours was often nothing more than an artificial gallantry, having more *esprit* than heart in it, yet not unfrequently the sport passed into fatal earnest, and adultery, murder, and revenge were the consequences.

Further, when, as often happened at great court-festivals, several troubadours were present, the latter used to indulge in competitions or verse-battles (*tensons*) among themselves, for the gratification of the high society assembled there; mostly on questions selected by the ladies from the "Laws of Love;" one or more of these ladies sitting as umpires at such poetic jousts, and deciding who were the victors. But although the troubadours as a rule monotonously confined themselves to themes of gallantry, yet sometimes their muse, especially in its satiric moods, ventured into higher regions, and glanced at the general conditions of society, or the graver evils of the times—as the wars between the English and French armies in southern France; the persecution of the Albigenses; the degeneracy of the clergy; the diminishing zeal for the crusades, etc.; or they even descended to depict the life of the peasantry, and sang their adventures with shepherdesses, etc., in *pastoretas* and *vaqueyras*. The most illustrious patrons of the troubadour poetry were the counts of Provence, particularly Raimund Berengar III. (1167–81), Alphonse II. (1196–1209), and Raimund Berengar IV. (1209–45); the counts of Toulouse, as Raimund de St. Gilles, who joined the ranks of the crusaders in 1096, Raimund V. (1143–94), and Raimund VII. (1222–49); Richard *Cœur de Lion* of England, himself a troubadour; Eleanor, wife, first of Louis VII. of France and afterward of Henry II. of England; Ermengarde, viscountess of Narbonne; the kings of Aragon, as Alfonso II. (1162–96), Pedro II. (1196–1213), and Pedro III. (1276–85); the kings of Castile, as Alfonso IX. (1188–1229), and more especially Alfonso X. (q.v.), surnamed the Wise; several Italian princes, as Bonifacio, count of Montferrat, and after 1204 king of Thesalonica, and Azzo VII. of Este (1215–63). These names also indicate the extent of territory on which the troubadour poetry was cultivated—viz., Provence, Toulouse, Poitou, Dauphiné, or briefly France s. of the Loire; Catalonia, Valencia, and Aragon in Spain; and part of Upper Italy. It lasted for about 200 years (1090–1290), and one can distinguish three periods in its history: (1) The period of its genesis or birth, or its development out of mere popular minstrelsy into artistic poetry (1090–1140); (2) its golden age (1140–1250); (3) the period of its decline (1250–90). The first of these periods is marked by a conscious striving after something finer and more poetic than the rude simplicity of the earlier verse; the second, by the loftiest expression of ideal chivalry and gallantry, and the most perfect development of artistic form; the third, by an ever-increasing serio-didactic tendency, and a degeneracy in poetic art. Thus the poetry of the troubadours rose, and ruled, and fell with that courtly chivalry which was at once its inspiration and its soul.

The long list of troubadours begins with GUILLEM IX. count of Poitiers (1087–1127), the earliest of whom we have any knowledge, and whose verses exhibit partly the popular ballad style, and partly a more elaborate mode of poetic conception. His life and works appear to have been equally immoral.—After him comes BERNARD DE VENTADOUR (1140–95), one of the first poets of the golden age of troubadour-minstrelsy. He was the son of a poor serf of the vicomte Ebles II. of Ventadour. Recognizing the talent of young Bernard, his master encouraged and assisted him; but his poetic enthusiasm was more excited by his passion for Ebles's wife, Agnes de Montluçon, than by Ebles's own commendations, and by the favor shown him by later patronesses, queen Eleanor, Joanna of Este, etc., all of whom he celebrated in fiery and delicate strains.—MARCABRUN (1140–85), a foundling, was much feared for his power of satire, and was, in fact, murdered by the castellan of Guian for an exercise of his fatal gift. He is reckoned the inventor of the art-song (*cansós*).—JAUFRE RUDEL, prince of Blaya (1140–70), is equally

famous for his languishing love-songs, and his romantic passion for the countess of Tripoli, whom he never saw till he was at the point of death.—PEIRE D'AUVERGNE (1152-1215), son of a citizen of Clermont, called himself "master of the troubadours;" yet his songs are more remarkable for their artistic finish than for their poetic inspiration.—GUILLEM DE CABESTAING (1181-96), son of a poor knight, has become famous through his tragic love for the wife of his lord, Raimon de Roussillon.—RICHARD THE LION-HEART'S song composed during his captivity in Austria, is widely known; and the songs of GUIRANT DE BORNEIL (1175-1220) have a manly and earnest ring about them; but perhaps the most celebrated of the whole fraternity was PEIRE VIDAL (1175-1215), a man wondrously endowed with poetic gifts, but who led so mad, wasteful, immoral a life, and committed such extravagant follies, that one doubts whether he was altogether sane. He was the terror of husbands.—BERTRAND DE BORN (1180-95), equally celebrated as warrior and poet, played an important part in the wars of Henry II. of England with his rebellious sons, and was a zealous French patriot. His songs are for the most part of a political cast, full of martial ardor and the love of fatherland. In his lifetime, men dreaded his sharp tongue no less than his keen sword.—FOLQUET DE MARSEILLE (1180-1231) was the son of a Genoese merchant established at Marseilles. After wasting his youth in amorous gayeties, in a fit of grief for the death of one of his many mistresses, he entered the church, rose to the dignity of bishop of Toulouse, and signalized himself by the fanatical zeal with which he persecuted the Albigenes. Folquet's songs, twenty-five in number, are of an impassioned nature.—RAMBAUT DE VAQUEIRAS (1180-1207), a native of the co. of Orange, in the s. of France, was the son of a knight, and so great a favorite with Bonifacio II., marquis of Montferrat, that the latter positively tolerated his sister's intimacy with the poet. He accompanied his patron to the East, and probably fell with him fighting against the Bulgarians. Some of his songs have found their way into different Romanic tongues.—PEIROT (1180-1225), in his condition and fortunes, curiously resembled his contemporary just mentioned. His pieces rank among the finest love-songs of the troubadours.—THE MONK OF MONTAUDON (1180-1200) is a poet whose proper name is not known. He was sprung from a noble family belonging to Auvergne, and became prior of Montaudon, but, notwithstanding, led the free life of a wandering poet. Finally, he betook himself to the court of Aragon; Alfonso II. made him prior of Villafranca, where he died. He was more renowned for his satire than for his sentiment, and his songs are full of personalities directed against his brother troubadours—very cynical and very caustic.—ARNAULT DANIEL (1180-1200), a nobleman of Riberac, in Périgord, whom love made a troubadour. His powers of invention have been highly praised. Petrarch calls him *il grande maestro d'Amore*. Dante also celebrates his genius.—GAUCELM FAIDIT (1190-1240), son of a burgher of Uzerche, in Limousin, led at first, with his wife Guillelma Monja, the free and pleasant life of a jongleur; but subsequently left her, and became enamored of the countess Marie of Ventadour, who made him her troubadour. He would fain have been her paramour also, but she was too prudent; and so, to revenge himself, he carried on intrigues with other women; but his sweetest songs were those he sang in his lady's praise.—RAIMON DE MIRAVOL (1190-1220), one of the most lovable of the troubadours, although the women—his spouse not excepted, who was herself a poetess—abused him so bitterly, that for two years he was out of his mind.—SAVARIE DE MAULEON (1200-30), a French baron, became grand seneschal of Aquitania, and took part with Raimund of Toulouse against Simon de Montfort. His political career was marked by great vacillation. As a poet, he is noted for his *Tenzone*.—PEIRE CARDINAL (1210-30), son of a knight, was intended for the church, but preferred the life of a troubadour, and traveled with his jongleur from court to court. Jago I. of Aragon was his great patron. He was a master of the moralistic *Sirventes*, and assailed—but only with a sort of generalized satire—the nobles and clergy.—The last representative of the troubadours was GUIRAUT RIQUIER (1250-94), a native of Narbonne. Although he had in his time many patrons, of whom the most distinguished was Alfonso X. of Castile, he was often in sore need; and his poems, full of complaints of the disrepute into which his order had fallen, may be regarded as the swan-song of troubadour poetry.—See Diez, *Leben und Werke der Troubadours* (Zwickau, 1829); Fauriel, *Histoire de la Littérature Provençale* (3 vols., Par. 1846); Galvani, *Osservazioni sulla Poesia de' Trovadori* (Modena, 1829), and *Fiore di Storia letteraria e cavalleresca della Occitania* (Milan, 1845); De Laveleye, *Histoire de la Langue et de la Littérature Provençale* (Brüss. 1845); Mahn, *Die Werke der Troubadours* (Berl. 1846); and *Die Biographien der Troubadours* (Berl. 1853); Brinckmeier, *Blumenlese aus den Werken der Troubadours* (Halle, 1849), and *Rügelieder der Troubadours* (Halle, 1846); Kannegiesser, *Gedichte der Troubadours* (Tüb. 1852), and *Ungedruckte Provenzal. Lieder* (1853); Bartsch, *Grundriss zur Geschichte der Provenzalischen Literatur* (1872); Bayle, *La Poesie Provençale au Moyen Age* (1876).

TROUP, a co. in w. Ga., bordering on Alabama; 493 sq.m.; pop. '90, 20,723 of American birth, incl. colored. Co. seat, Lagrange.

TROUP, GEORGE MCINTOSH, 1780-1856; b. near the Tombigbee river, Ala.; graduate of the college of New Jersey, 1797; studied law; resided in Georgia; member of the legislature, 1800-3; member of congress, 1807-15; U. S. senator, 1816-18 and 1829-34;

governor of the state, 1823-27. He was a popular speaker of extreme views in regard to state rights and state sovereignty, and with principles of unswerving integrity.

TROUP, ROBERT, LL.D., 1757-1832, b. N. Y.; studied law, but in 1776 joined the revolutionary army as lieutenant. After the battle of Long Island he was confined in the Jersey prison-ship, and after his exchange became aid to Gen. Gates, and was in the battles of Saratoga and Stillwater and at the surrender of Burgoyne. In 1778 he was made secretary of the board of war. After the war he was a member of the N. Y. legislature, and a judge of the U. S. district court.

TROUSDALE, a co. in n. Tennessee, formed in 1870; intersected in the s. by the Cumberland river; 166 sq. m.; pop. '90, 5850, chiefly of American birth. Co. seat, Hartsville.

TROUS-DE-LOUP, or **WOLF-HOLES**, are hidden holes about 6 ft. deep, and $4\frac{1}{2}$ in diameter at the top. They are funnel-shaped, and have one or more pointed stakes at the bottom. They are placed often thickly about the glacis and approaches to a fortress; the object being to break the ranks and otherwise disorganize an attacking force.

TROUT (Fr. *truite*, from M. Lat. *tracta*, which, according to Diez, may be from Gr. *trok-tes*, the name of a voracious sea-fish, derived from *trago*, to eat), the popular name of many species of the genus *salmo*, as characterized by Cuvier, some of which are referred by Valenciennes to his restricted genus *salmo*, some to *fario*, and some to *salar*. See **SALMON**. The name is given to some of the silvery species, migrating to the sea, and to all the yellow species, which constantly inhabit fresh waters. The former are noticed in the article **SALMON**; the present article is devoted to the latter.

Trouts are found in almost all the lakes and rivers of the temperate and colder parts of the northern hemisphere. The **COMMON TROUT** (*salmo fario* or *salar Ausonii*) is widely diffused in the eastern hemisphere, abounding in almost all the lakes and rivers of the British islands and the n. of Europe. It is found even in very small streams, and almost to their mountain sources, but attains its largest size where there is considerable depth of water and abundance of food. An instance is on record of a trout caught in England, in a branch of the Avon at Salisbury, weighing 25 lbs.; but such a size is very rare, and even in ponds where the trout are regularly fed, they seldom exceed 10 lbs. A trout of 1 lb. or $1\frac{1}{2}$ lbs. is reckoned by the angler a very fine fish; and many a stream swarming with trout produces none nearly so large. The head of the common trout is large; the eye large; the general form symmetrical, stouter than that of the salmon, the convexity of the outline of the back nearly similar to that of the belly; the tail is slightly forked, except in old fish, in which it becomes almost square, and sometimes even slightly convex. The teeth are numerous, strong, and curved; two rows of them extending along the whole length of the *vomer*, with no marked group at its front. The color is more or less yellow, but the tint varies much in the trout of different waters, sometimes passing into greenish black or violet. The color is brightest in the trout of clear streams. On the back and upper part of the sides there are numerous spots of black and red; the belly is silvery white. The spots on the sides vary much. The fins are light brown; the dorsal fin and tail with numerous darker brown spots. The varieties which the common trout exhibits in tints and spots has led to the supposition that several distinct species have perhaps been confounded as one, and attempts have been made to point out their characters; but these have not proved satisfactory to the greater number of naturalists. It is certain that the appearance of the trout is much affected by the character of the water in which it lives, and the food with which it is supplied. The trout of a river with a muddy bottom are very different from those of a clear stream, and those of a stream darkly colored by moss are easily distinguished. The tint of the flesh varies as well as the external colors, being pink in some—the finest for the table—and white in others. It has been found that trout transferred from one locality to another soon change their tints.

The trout is very voracious, and readily devours almost any kind of animal food. Worms and slugs washed into rivers by rains are very acceptable to it. Small crustaceans are supposed to be the chief food of trout in some lakes and streams which are noted for the excellence of their produce. Small fresh-water shell-fish are also a favorite food of trout. Small fish of any kind which they can capture are their prey, and multitudes of salmon-fry thus perish. A gentleman well known to the writer of this article caught a large trout which had a very young viper in its mouth, bitten into three pieces; not yet swallowed, probably, because there was not room for it in the over-gorged stomach. The leaping of trout for flies in a summer day or evening adds to the charm of any a rural scene. Small trout often throw themselves quite out of the water; the larger ones in general merely rise to take struggling flies from its surface. The angler adapts his lures to the season and the weather. In spring and summer, when the weather is fine, the artificial fly is very successful; bait, generally the worm, is used in wet weather, or when the streams are much swollen by rains. The minnow is a good bait for large trout. No bait is more deadly than salmon roe, but the use of it is prohibited by law in Britain, for the sake of the salmon fisheries.

The trout generally spawns in the end of October, when the lower jaw of the male becomes elongated but not so much as in the salmon. The spawn is deposited in the same manner as that of the salmon, in gravelly beds, in running streams; and the trout

of lakes ascend streams for this purpose. Where trout have no access to proper spawning-ground, recourse must be had to artificial means to increase the stock (see PISCICULTURE); but in many small streams their numbers seem incapable of being diminished by any amount of angling. The best feeding-grounds are often where there is no good spawning-ground within reach of the fish. The trout grows rapidly when it has abundant food. From instances of individuals kept in wells and ponds, it is known to attain an age of 30 or even 50 years.

Among the varieties of the common trout, one called the GILLAROO TROUT is found in rough Neagh and other lakes of the n. of Ireland. It attains a large size, is very thick in proportion to its length, and has much smaller teeth than the ordinary trout.

The LOCHLEVEN TROUT (*salmo Levenensis* or *S. cæcifer*) is found in Lochleven in Scotland, where the common trout is also found, and is distinguished from it by the more pointed pectoral fins; the much longer rays of the tail-fin, which is also more pointed at its extremities; and particularly by the number of the caecal appendages, which are from 60 to 80 in the Lochleven trout, while they do not exceed 46 in the common trout. The flesh of the Lochleven trout is not white or pink, but red. It attains a large size.

The GREAT LAKE TROUT (*salmo ferox*) is the only other British species. It is found in some of the larger British and Irish lakes, and in the lakes of Scandinavia, seldom, if ever, ascending rivers, except for a short distance at the spawning season. It attains a size of almost 30 lbs., is a very powerful, active fish, and tries the skill of the angler in no small degree. It differs from the common trout in the longer muzzle, in the position of the fins, in having the tail square in all stages of growth, and in other characters. Its color is generally deep purplish brown, passing into greenish or grayish yellow on the belly. The spots are large, and not numerous. The great lake trout feeds much on small fishes, and is as greedy as a pike. It is taken by night-lines, or by trolling with strong tackle and a small trout or other small fish for bait. Young fish are taken with the artificial fly. The flesh of this species is very inferior in quality to that of the common trout.—Very different from it is the LAKE TROUT of the lake of Geneva (*salmo* or *fario Lemanus*), which is a fish of excellent quality, and nearly allied to the salmon trout. See SALMON. It ascends the rivers which fall into the lake, as the salmon trout ascends rivers from the sea.

North America has numerous species of trout. One of them, the COMMON BROOK TROUT, or SPECKLED TROUT (*salmo fontinalis*), is so similar to the common trout of Britain, that it may also be regarded as a variety rather than as a distinct species. It abounds in the streams of Canada and the more eastern British provinces, and in the northern and middle parts of the United States.—The NORTH AMERICAN LAKE TROUT (*salmo confinis*) inhabits the deepest waters of the great lakes, and sometimes attains a weight of more than 60 lbs. It is dark-colored, mottled with grayish spots. Its flesh is dirty yellow, and of very poor quality. It never takes the fly, but may be caught with the minnow, or a bait of fat pork. It is more sluggish than its congeners, and affords poor sport to the angler. There are several species of lake trout in North America. The finest in quality, as well as largest in size, is the MACKINAW TROUT or NAMAYCUSH (*Salmo amethystus* or *namaycush*). It is not found in lake Erie, nor in lake Ontario, but in lake Huron, lake Superior, and the more northern lakes, even in those of the arctic regions. It inhabits the deepest parts of them, except in autumn, when it resorts to shallow water for spawning.—The SISKIWIIT TROUT (*salmo* or *salar siscowet*) of lake Superior is of large size, stout, thick, and of rich flavor, but so fat as to be almost unfit for food.—The RED-BELLIED TROUT (*salmo* or *fario erythrogaster*) of the lakes of New York and Pennsylvania, sometimes $2\frac{1}{2}$ ft. in length, is deep greenish on the back, lighter on the sides, which are spotted with red, the belly orange red.

The n.w. of America has its own peculiar species of trout, one of which, the OREGON TROUT (*salmo Oregonensis*), is found in almost every stream from the snowy peaks of the Rocky mountains to the sea, and is very similar to the common trout of Europe.

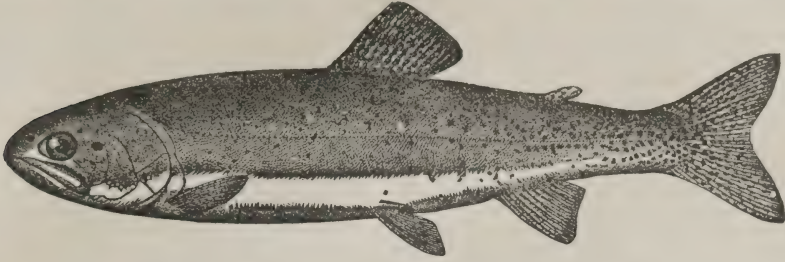
Within the last ten years several new species of native trout have been brought to the notice of American scientists; and a number of foreign varieties, selected with reference to their tendency to acclimatization, and their value as a probable source both of



THE GREEN-BACK TROUT (*S. mykiss stomia.*.)

sport and food supply, have been imported into the United States. The native species include the yellow-fin and green-back trout of Colorado, inhabiting the basin of the

Upper Arkansas, and especially associated with Twin Lakes, near Leadville. Of these the yellow-fin trout was recognized in 1889 as a distinct sub-species by Dr. David S. Jordan, President of Stanford University, and named by him *Salmo mykiss Macdonaldi*, in honor of the United States Commissioner of Fisheries, Marshall McDonald. It

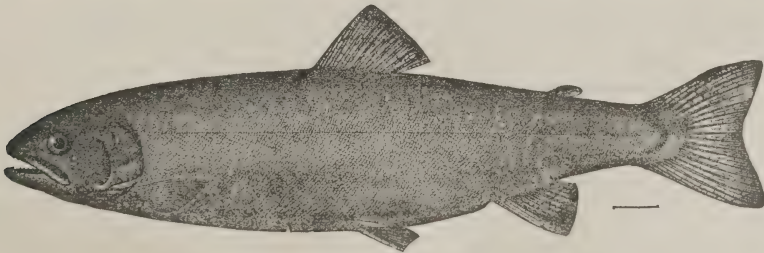


THE YELLOW-FIN TROUT (*S. mykiss Macdonaldi*).

attains a weight of seven or eight pounds, and is regarded as a desirable food-fish. The color of the flesh is pale in consequence of its fish diet ; while the flesh of the green-back trout (*Salmo mykiss stomias*) is of a brilliant salmon tint, conditioned by the red pigments of the crustacea upon which it subsists. The latter has for a number of years been known as native to the tributaries of the Arkansas and the Platte.

Another species of trout, whose presence in the United States was unsuspected, made its appearance, in 1881, in Sunapee Lake, New Hampshire, a large and deep body of water situated at an elevation of 1100 feet above the sea, on the watershed which separates the Connecticut and Merrimac river-basins. This trout, or more properly charr, is now scientifically known as the *Salvelinus alpinus aureolus*, from its golden hue and its identity with the Alpine trout of Europe. Three specimens were taken in 1881 ; but it was not until 1885 that large schools of this stranger fish were found on a mid-lake spawning-bed by the fish and game commissioners. Individuals were at once submitted to scientists for classification ; but great differences of opinion prevailed in regard to its species and origin until in November, 1890, Professor Garman of the Museum of Comparative Zoology at Cambridge, Mass., unhesitatingly pronounced it a form of European saibling, and therefore an introduced variety. The fish has since been discovered in a lake belonging to the Ossipee system, on the Maine divide, and the claim has been advanced that it is an American representative of the saibling. But Professor Garman's classification is confirmed by the fact that this trout was wholly unknown in Sunapee waters until 1881, the only trout native to the system being the common brook-trout ; and there is no trustworthy evidence that it has existed for a longer period on the Eastern watershed. The slight structural differences between the Sunapee charr and the European saibling are fully explicable on the ground of change of habitat and climate. It is admitted that German saibling reached New Hampshire at least as early as 1879.

The distinguishing characteristics of the Sunapee charr are the presence of a broad band of teeth on the hyoid bone, the absence of mottling on the back, so marked in the brook trout, a nearly square tail, prominent fins, a small and delicate mouth, and a



THE SUNAPEE TROUT (*S. alpinus aureolus*).

phenomenally brilliant nuptial coloration. The fish, which is silver white in summer, with pale or hardly perceptible olive spots, is metamorphosed at the October spawning season into a dazzling orange-colored beauty, richly decorated with flecks of blazing yellow or vermillion. The females, usually cream-tinted, or of a delicate green tempered with violet, are occasionally as highly colored as the males ; the back in each sex is of a deep steel blue. Those who have seen these graceful creatures on the spawning beds, in all their glory of color and majesty of action, pronounce it a spectacle never to be forgotten. The presence of this charr in Sunapee Lake has not as yet been satisfactorily accounted for. Young fish now swarm in the depths, and specimens have been

taken up to seven pounds in weight. Like all charr, the Sunapee trout affects cold water, and is angled for in summer, with a live minnow or smelt, in water sixty to seventy feet deep.

Among imported varieties the common brown trout of Europe (*Salmo fario*) has adapted itself readily to our climate, and rapidly attains great size in our waters. Its beauty, fighting qualities, and delicious flavor render it an important addition to our *Salmonidae*, and it is now propagated artificially to a considerable extent in the United States. The Loch Leven trout (*Salmo levenensis*), a graceful, silvery fish, with round or X-shaped black spots, takes its name from Loch Leven, Kinross-shire, Scotland. Originally a sea-going or anadromous fish, it is now non-migratory, having become land-locked in this lake. Justly celebrated throughout Great Britain as the gamiest of her trout, it has proved a most desirable form to cultivate, growing rapidly and to a greater average size when transplanted from its native waters, and under favorable conditions attaining a weight of seven to eight pounds. It crosses readily with the common trout and the salmon, both hybrids being fertile. The Loch Leven trout has been exported from the Howietoun Fishery, near Stirling, to New Zealand and South Africa, and has become acclimated in the streams of Madras. The first purchase for American waters, by a private party, was made in June, 1886, by Professor John D. Quackenbos, of Columbia College, New York, who went to the loch for the purpose of studying the life-history of the fish. The 30,000 eyed ova shipped to Professor Quackenbos were hatched at Plymouth, New Hampshire, and planted in Sunapee Lake. The State of New York and the U. S. Government have since made extensive importations of the Loch Leven trout. It has been introduced into Adirondack waters, into Lake George by A. N. Cheney, of Glens Falls, into the waters of Dutchess Co., New York, and into certain ponds and streams on Long Island. Specimens of 2½ lbs. weight have already been taken from Woodhull Lake in the Adirondacks. The sea-trout (*Salmo trutta*) of North Britain, a fish which ranks next to the salmon in the estimation of English anglers, was introduced into this country in 1890 by the Shooting and Fishing Publishing Co., of Boston, but with what result is not yet known.

TROUVÈRE. See TROUBADOUR.

TRO'VER, in American law, is an action brought to recover goods from a person to whom they do not belong, but who has in some way obtained possession of them. It was founded on the old fiction, that the rightful owner had accidentally lost the goods, and the party in possession had found them, and would not give them up to such owner. It is practically an action to try the title to the goods, and therefore is of extensive application in the law of contracts, as well as other branches of law. The plaintiff, if successful, recovers the value of the goods as a satisfaction. The defendant is said to have illegally converted or appropriated the goods, and it is by the conversion of the goods that the damage is done, and for which the remedy is given.

TROWBRIDGE, a market-t. of Wiltshire, stands on a rocky eminence in the valley of the river Biss, 10 m. s.e. of Bath. In the church of St. James, which dates from the 14th c., Crabbe the poet officiated as clergyman from the year 1814 to 1832, and his remains repose under a monument in the chancel. The town has long been the seat of woolen manufactures, and these, within recent years, have been carried on with much spirit and success. Cassimeres, kerseys, tweeds, and woolen cloths of the best qualities are manufactured. Many handsome villas have been erected outside the town by the wealthy manufacturers. Pop. '81, 11,041; '91, 11,717.

TROWBRIDGE, EDMUND, 1709-93; b. Mass.; graduated at Harvard, 1728. He was called to the bar, where he rose to eminence. He became attorney-general of the state in 1749, was a member of the council, and in 1767 was appointed chief-justice. His attitude in regard to the disputes between Great Britain and the colonists was too judicial to suit the latter, and he resigned from the bench in 1772.

TROWBRIDGE, JOHN, American scientist, b. 1843, educated at the Lawrence scientific school of Harvard university, where he afterwards taught. In 1880 he was made professor of experimental physics and in 1888 was appointed to the Rumford chair of the Application of Science to the Useful Arts. He has made a number of important discoveries and inventions. Among the latter is his closed magnetic circuit transformer. Many of his papers have been issued under the title of *Contributions from the Physical Laboratory of Harvard College*. Besides these he has written *The New Physics* (1884), and was an editor of the *Annals of Scientific Discovery for 1869* (1870), and of the *American Journal of Science*.

TROWBRIDGE, JOHN TOWNSEND; b. N. Y., 1827; settled in Boston in 1847, and became a writer for the press and of stories. Among his many works are *Neighbor Jackwood* (1857); *Cudjo's Cave* (1864); *The Three Scouts* (1865); *Neighbors' Wives* (1867); *Fast Friends* (1874); *The Lost Earl and other Poems* (1888), etc.

TROWBRIDGE, WILLIAM PETIT; b. Mich., 1828; graduated at West Point, 1848, standing first in his class. During the civil war his scientific attainments were of great value in the construction and repairing of forts and bridges, and he had charge of the New York branch office of the engineer department. After the war he was connected for some time with the New York Novelty iron works; from 1870-80 held the professorship of mechanical or dynamic engineering in the Sheffield scientific school of Yale college, and later a similar chair in Columbia college. He died in 1892.

TROY. The earliest traditions of the Greek people, as contained in their oldest poetry and history, represent the country on both sides of the *Ægean* as peopled by various races, either of genuine Hellenic, or of closely affiliated tribes. Among those who peopled the eastern or Asiatic coast are specially named the Pelasgi, the Leleges, the Caucones, the Carians, the Lycians, and the Trojans. These last, to whom Homer's poem has given a celebrity that throws all the rest into the shade, occupied the small country in the n.w. corner of Asia Minor, best defined, perhaps, as the region of mount Ida, with its topographical dependencies. That the Trojans were either a Greek race, or some non-Hellenic people under a Greek dynasty, seems probable, from the absence in Homer of any such decided national contrast between Greeks and Trojans, as we find in mediæval poetry between Christians and Saracens. Local legends represented them as closely connected with Crete; and Homer in the *Iliad*, xx., makes Priam the sixth in descent from Dardanus, the first of the dynasty, who was supposed to have come from Crete. The story of the Trojan war, which forms the subject of Homer's great poem the *Iliad*, is extremely simple. The Trojans, in the person of Paris, or Alexander, the son of the reigning monarch, Priam, are represented as having had certain dealings with the Achæans, or Greeks of the Peloponnesus, in the course of which the gay young prince carries off from the palace of Menelaus, king of Sparta, his spouse Helen, the greatest beauty of her age. To revenge this insult, the Greeks banded themselves together, and sailed against Troy with a large fleet. All the Greek tribes afterward famous in history took part in this expedition; but the most notable were the Argives or Achæans—Greeks of the e. and n. part of the Peloponnesus, and adjacent isles; the Spartans—Greeks of the s.e. district of the Peloponnesus; the Neleids—Greeks of the w. coast of the Peloponnesus; the Boeotians, and the Thessalians. Of the Thessalians, the most prominent captain was Achilles; and the general command of the whole expedition was committed to Agamemnon, king of Mycenæ, as the head of the most numerous contingent, and at the same time the brother of the royal person whose hospitality had been so grossly violated. This well-appointed European army is represented as having spent nine years in besieging the god-built walls of the city of Priam without making any impression on its strength. A violent quarrel between Achilles and Agamemnon, breaking out in the tenth year, so weakened the invading force that the Trojans, under Hector, pushed the Greeks back to the very verge of the sea, and almost set their ships on fire. This quarrel forms the subject of the *Iliad*. At the critical moment, however, the Thessalian captain is reconciled to the head of the expedition; and with his return to the field, the fortune of war changes; Hector, the champion of Troy, falls, and the impending doom of the city is darkly foreshadowed. The siege and sack of Troy did not fall within the plan of Homer's poem, but are narrated at length in the *Post Homericæ*, a Greek poem by Quintus Smyrnaeus, a poet of the decadence. The Greeks possessed a long series of popular poems called the *Cyclic poems*, in which the whole sequence of the Trojan story was narrated, giving completeness to the brilliant fragment, which has been adorned by the genius of Homer. From these poems—of which the abstracts are still preserved—Virgil derived those materials which he has used with such effect in the second and third books of his great poem. The *Cyclic poems*, besides the events in the Trojan war after the death of Achilles, contained an account of the various colonies in Italy and elsewhere believed to have been founded by the scattered chiefs of the expedition after their return home. Of these, the settlements of Diomedes, Philoctetes, and Indomeneus, on the s.e. coast of Italy, and that of *Æneas* on the banks of the Tiber, are the most famous. The chronology of the Trojan war, depending as it does mainly on artificial construction from genealogical data, is not, of course, trustworthy; but there are good reasons for believing that the generally received date 1184 B.C. is not far wide of the mark. After the fall of the kingdom of Priam, the future story of Troy is short and uneventful. Under the Lydian kings, whose dynasty culminated in Cræsus, a new Troy—*Ilion Novum*—began to creep into notice, which, from the glory that belonged to its name, and the favor of Alexander the Great, Julius Cæsar, and other influential visitors, grew into some significance. The interest which attached to it, however, in its most flourishing estate was more antiquarian than political.

How far the events of the Trojan war, as found in Homer and the *Cyclic poems*, are to be taken as historical, depends upon the view which is taken of the general character of the materials of popular ballad poetry in all countries. That there is in the general case an under-stratum of historical reality, out of which the earliest popular poetry grows, may be assumed as certain. But how strong the tendency is, in early uncritical ages, to erect on this foundation a purely imaginary superstructure, need scarcely be mentioned. At the same time there is a very great difference to be observed in the popular poetry of different nations, in respect of the greater or less amount of trustworthy historical matter which lies embedded in the imaginative conglomerate. The excess of the imaginative, fanciful, and altogether improbable element is found in our own Arthurian and Carolingian romances. In Homer, on the other hand, there is a sobriety of tone, a geographical clearness, and a general air of verisimilitude, which incline the reader to accept the historical reality of the main facts. In the first chapter of Herodotus we find the Phenicians practicing the very same act of abduction, though in a more violent form, which the poet represents as having kindled the famous ten

years' warfare between Greece and Troy; and, even in the most general view, the war of Troy between rival peoples on the opposite sides of the Ægean may be looked on as the natural overture of those great struggles, by which, on the same theater afterward, the fate of the world, indicated by the preponderance of the European over the Asiatic element, was more than once decided.

The PLAIN OF TROY is formed by the débris of the great chain of mountains which terminates the peninsula of Asia Minor on the n.w., where it is separated from Europe by the sea of Marmora and the narrow strait of the Dardanelles. This chain of mountains is called Ida by Homer (*ide*, wood); and its highest peak toward the s. side of the Troad, overhanging the bay of Adramyttium, is celebrated by the same poet as Gargarus. Westward from this chain the land slopes gradually down by a series of undulating ridges to the s. coast of the Dardanelles. The plain included between these ridges and the sea is the plain of Troy. It is surrounded on all sides by elevated ground, by hills and mountains toward the e. and s.e., and by rocky ridges or cliffs along the coast. At one place only does it open to the sea, and this is at the extreme n.w. corner, where it meets the s. end of the Dardanelles. Here there is a stretch of sandy shore about two m. in length, beginning behind the Turkish fort of Koumkale, and trending eastward. This is the only place where a fleet such as that described in the *Iliad* could effect a permanent landing; and here, accordingly, by general consent, the encampment of the Greeks is placed. The promontory which bounds this bay to the e. is universally acknowledged as the Rhætan promontory of the ancients, while that on the w. is the Sigeon. Here, also, as the natural mouth of the plain, the principal river, by whose action mainly it was formed, finds its way into the sea. This river is the Mendereh, obviously a corruption of the Homeric Scamander, called also by the poet Xanthus, from *xanthos*, that is, the *yellow* river, from the color of its waters; a quality which has been noticed by most modern travelers. Looking up the plain from any of the heights about the mouth of the river in a south-easterly direction toward Gargarus, its course can easily be traced to a distance of about nine m., where it emerges into the plain through a defile in the mountains. This distance of nine m., therefore, is the extreme length of the plain of Troy. Its breadth is about three miles. It presents the appearance of "a long tract of meadow-land, inclosed within a girdle of low, round-backed hills, and prettily garnished by many lines of trees, which skirt the water-courses." These waters, with the single exception of the Scamander, are not large enough, according to our usage, to deserve the name of rivers, but are mere mountain-torrents or brooks, generally dry in summer, some of them nothing better than a sort of natural drains or ditches. Those deserving of mention are three: the first flowing from the chain of Ida westward into the plain, about three m. from the sea, called the *Dombrek*; the other in the same direction, about five m. further up, called the *Kimaiir*. The third streamlet rises at the head of the plain, near the Turkish village of Bunarbashi, and creeping along the bottom of the slope toward the Archipelago, forms the boundary of the plain on the w., and empties itself into the Mendereh, about two m. above its mouth. One of these streams must be the Homeric Simois.

The topography of a plain so famous in the history of human civilization has, of course, occupied the attention of the learned both in ancient and modern times; and a considerable library could be formed of volumes in which this region has been described, and its most famous localities discussed. The topographical result of these voluminous discussions can, however, now be given in a very few sentences. In the first place, after seventy years of confusion and hallucination, it may be regarded as certainly established, that the Mendereh is the Scamander. It is also universally allowed that *Novum Ilium*, or New Troy, occupied the site of Hissarlik, on an eminence about four m. from the mouth of the river, on its right bank, near the bend of the Dombrek. It is also a matter of general consent, that the great tumulus or barrow, near the Sigeon promontory, where the Dardanelles broaden up into the wide Ægean, is the veritable monument of Achilles, described by Homer in a famous passage of the *Odyssey*; but beyond these three points, it cannot be said that any part of the classical topography of the plain has been ascertained with certainty. The great point to determine, of course, is the site of the Homeric Troy, the capital of the empire of Priam; but this is a matter which, in default of inscriptions, can be ascertained only by previously deciding which of the three streamlets above mentioned is the true heir to the legendary glories of the Homeric Simois; for between the Scamander and the Simois the tide of battle rolled to and fro, as Homer expressly tells us; and at the head of the plain between these two rivers the town of Troy must certainly stand. Those who hold with Strabo among the ancients, and Maclaren among the moderns, that the Dombrek is the Simois, have strong grounds for maintaining that New Troy was built upon the site of Old Troy, and that no further search is necessary; while they who look on this point as suspicious, must recognize the Simois in the river of Bunarbashi, and the site of the Pergamus of Priam on the plateau at the great bend of the Scamander, about a m. to the eastward of the village of Punarbashi, where the substructions of an ancient city have been lately excavated. Those who wish to see this nice topographical question discussed in the most masterly style, will read *The Plain of Troy Described*, by Charles Maclaren (Edin. 1863), on the one side; and *Ueber das Homerische Ilium*, by Prof. Welcker, in his collected tracts (Bonn, 1845), on the other. A succinct exposition of the arguments on

both sides will be found in Prof. Blackie's notes to the *Iliad*, Book xxi. The literary history of this topographical question, commencing with the work of Le Chevalier, a Frenchman, translated into English by Prof. Dalzel in 1791, is extremely curious; but the most distinguished scholars and topographers being now agreed that the Mendereh and the Scamander are identical, it is not necessary to make any allusion to the wonderful discovery of "the wells of the Scamander," by which Le Chevalier imagined he had made himself immortal. Dr. Schliemann, who had carried on a systematic investigation of the supposed neighborhood of ancient Troy, believed he had found, at Hissarlik, its veritable site.

The result of Schliemann's labors, in which he was assisted ultimately by other trained observers and skilled architects, shows that on, around, and near the hill of Hissarlik there are piled up the remains of seven successive towns or cities. Deepest beneath the many yards of superimposed rubbish and ruins are traces of a town of small size on the hill, of absolutely unknown date. The next above it is greatly larger, the hill having simply been its citadel, and shows traces of grandeur. This city, also prehistoric, seems to have been overthrown by some great catastrophe about the 12th c. B.C., certainly not later than the 10th c.; and it is this that Dr. Schliemann ultimately came to regard as identical with the Troy of Priam and of Homer's poetry. In *Ilios*, Dr. Schliemann was inclined to identify with the Homeric city that whose traces are found third in order from the bottom. The last and highest of the series is the fifth historic one, the *Novum Ilium*, above mentioned, which disappeared from history about the 4th or 5th c. A.D. Enormous quantities of prehistoric and other pottery were exhumed, as also some gold ornaments and vessels, and numerous weapons of bronze and stone. Into the questions of the artistic value of the remains successively brought to light, of the relation of Greek to Phrygian art, of the Greek people to the Asiatics, and of the Trojan race to other races (Dr. Schliemann believed the Trojans to have had Indo-European or even Germanic affinities), we cannot here enter, but must be content to refer to Dr. Schliemann's works, and the discussions provoked by them. See his *Ilios*, 1880, and *Troja: Results of Latest Researches and Discoveries on the Site of the Homeric Troy* (1883).

TROY, city and co. seat of Rensselaer co., N. Y.; on the east bank of the Hudson river, at the head of tide-water and steam navigation; 151 miles north of New York and six miles north of Albany, in latitude 42° 44' north, and longitude 73° 41' west. The site now occupied by Troy was included in the Van Rensselaer grant of 1629, and one of the first settlers was Van der Heyden, who owned a farm of sixty-five acres, which was regularly laid out in streets sixty feet wide in 1787. It bore various names until 1789, when the classic one of Troy was adopted. The city charter was granted in 1816. The first newspaper was issued in 1791, and a Presbyterian church was organized the same year. The inhabitants numbered about fifty, and were mostly from New England. Troy is built partly on a plain which stretches along the river for about three miles, and partly on a range of hills at the east, from the higher peaks of which, Mt. Ida and Mt. Olympus, fine views far up and down the Hudson may be obtained. A steam railroad, belt-line, connects this city with Albany, half-hourly, and electric cars traverse the streets in every direction and connect with the suburbs; there are several bridges across the Hudson. Troy has suffered severely by fires, one of which, in 1862, destroyed property worth \$3,000,000. Among the prominent public buildings are the city hall, county court house, the new granite custom house and post office, an elegant new music hall, the Young Women's Association home, and the Alumni building of the Rensselaer Polytechnic Institute (q. v.), one of the best in the country. There are also the Marshall infirmary and insane asylum, Troy orphan asylum, Troy male orphan asylum, Church home, Day home, Home for the aged poor, Troy hospital, House of the Good Shepherd, a Young Men's Association, a public library, a Roman Catholic theological seminary, and the Emma Willard seminary, founded in 1821, the oldest school in the country devoted to the higher education of women. The institution was enlarged in 1895 by a gift of \$150,000 from Russell Sage and the erection of Gurley and Plumb memorial buildings. Other noteworthy institutions are the Lasalle institute and St. Peter's academy. Troy has several public parks and a beautiful cemetery, Oakwood, overlooking Cohoes Falls, and containing monuments to major-generals Thomas and Wool, and the Earl memorial chapel and crematory. There is a fine soldiers' and sailors' monument in Washington square. Troy has an excellent high school and many public schools, about 70 churches, national and savings banks, daily and weekly newspapers. The city is well drained and supplied with water from Piscawen creek, and lighted with gas and electricity.

Troy forms, with West Troy, Lansingburg, Waterford, and Cohoes, one of the great manufacturing centers of the United States. Both steam and water-power are used, the latter being obtained from a dam across the Hudson, and from Wyanant's and Potsenkill creeks. In Troy alone 840 establishments were reported in 1890, with a combined capital of \$24,030,753, and an output valued at \$29,248,750. The first Bessemer steel works in America were established in Troy in 1865, and there are now many steel-working plants. A single establishment employs from 2200 to 2400 workmen, with wages of \$1,250,000. Tens of millions of the Burden machine-made horseshoes are produced annually, and the principal European nations have purchased the right to manufacture them. Meneely's church bells vibrate all over the world, and passenger and freight cars are ex-

ported in large numbers. Thousands of tons of boiler rivets, nails, spikes, files, axles, bolts, besides stoves, ranges, steam-engines, hot-air furnaces, machinery, scythes, and other manufacturing implements are produced annually. Troy shirts and collars and cuffs and Troy laundries are known in every quarter of the globe. The Hudson river and the Erie canal afford fine opportunities for commerce, besides the railroads entering the city. On the opposite side of the river is a United States arsenal with large workshops. The New York Central and Hudson River, the Delaware and Hudson, and the Fitchburg are the principal railroads. Population, 1810, 3895; '40, 19,334; '60, 39,235; '80, 56,747; '90, 60,956.

TROYES, a t. of France, formerly capital of the province of Champagne, and now of the department of Aube, on the left bank of the river Seine, 103 m. e.s.e. of Paris by railway. It is a very old-fashioned place, and most of the houses are of wood. The principal buildings are the cathedral, dedicated to St. Peter, a splendid specimen of *flamboyant* Gothic, founded in 872, and rebuilt between the 13th and 16th centuries; the churches of St. Urban, the Madeleine, St. Pantaleon, and St. Remi, the Hôtel de Ville, a public library, containing 110,000 vols. and 2500 MSS.; a museum, the palace of justice, the exchange, merchant's hall, and various educational institutions. Troyes is not so populous or important as it was in the middle ages. Even as late as Henry IV.'s time, it had more than 60,000 inhabitants; in 1896 the pop. was 52,998. It carries on numerous cotton and woolen manufactures, and, as the center of a rich agricultural region, it has a large transit-trade.

Troyes, anciently the capital of the Celtic Tricassii, was called by the Romans *Augustobona*; later, *Civitas Tricassium*; and then *Treca* (a corruption of Tricassii), whence the modern Troyes.

TROYON, CONSTANT, 1810-65; b. Sèvres; first employed as decorator of china in the porcelain works; became an eminent painter of landscapes and animals; began to exhibit, 1836, and was soon afterward presented with medals of the first-class, and acquired an immense fortune. His "*Vallée de la Tongue*" first brought him into notice. He painted pictures illustrating St. Cloud and Sèvres, which gained the popular favor. His "*Osier Bed*" sold in Paris for 24,200 francs; his "*White Cow chased by a Dog*," 10,400 francs; and "*Pastures near Trouville*," 1200 francs.

TROY-WEIGHT. The origin of the term "troy" is unknown; some consider it to be a corruption of *le roy*, as the troy pound was, till recently, the standard pound (*pondus regis*); some derive it from *Troy novant*, the monkish name for London; while the majority of philologists and lexicographers profess to see the origin of the name in the town of Troyes, in France, an important center of commerce during the middle ages, which hence *may*, like the towns of Cologne, Toulouse, and others, have had its own special system of weights; though why the term should have migrated to Britain, and been exclusively employed there for so long, is not at all evident. A troy pound (of what value is unknown) is first mentioned in Britain in 1414, long before which period the standard pound of 12 oz., as well as another pound (the tower pound) of 12 oz., was in use. The term "troy" was first applied to the standard pound in 1495, but at the same time no change seems to have been made in its value, and it continued, as before, to be exclusively employed by the dealers in the precious metals, gems, and drugs. See POUND. The troy pound contains 12 oz., each ounce 20 penny-weights, and each penny-weight 24 grains; thus the pound contains 5,760 grains and is to the avoird. pound as 144 to 175; while the troy ounce is to the avoird. ounce as 192 to 175. For medicines other subdivisions of the troy pound were formerly employed; but now medicines are weighed by the avoirdupois (q.v.) standard. The old English pound, to which the term troy was afterward employed, was doubtless the pound of silver; and the tower pound of 12 oz. differed from it only by $\frac{1}{4}$ of an ounce.

TRUCE, a suspension of hostilities between two armies or states for a period specially agreed upon. During a truce it is dishonorable to occupy more advanced ground or to resort to any act which would confer advantage. A truce requires ordinarily to be confirmed by the commander-in-chief to become binding. It is lawful to break it before the prescribed period, on notice previously agreed on being given to the opposite party. This is called denouncing a truce.

TRÜBNER, NICOLAS, b. Germany, 1817; removed to London, where he became the head of the publishing house of Trübner & Co. He published a translation of Conscience's *Sketches from Flemish Life* (1845), and a *Bibliographical Guide to American Literature* (1855). He was a good oriental scholar, also familiar with Basque. He d. 1884.

TRUCE OF GOD. See GOD'S TRUCE.

TRUCK-FARMING. See AGRICULTURE.

TRUCK-SYSTEM (French *troquer*, Scotch *trock*, to barter or exchange) is applied to the practice of paying workmen in goods instead of current money.

TRUE CROSS, or HOLY ROOD, THE, said to have been discovered at Jerusalem, 326 A.D., through the exertions of Helena, the mother of Constantine, who had determined

to commemorate his conversion by building a church on the spot where the cross of Christ had stood. Helena went to Jerusalem, had the whole place cleared and extensive excavations made. The holy sepulcher was discovered, as was claimed; the three crosses found, with the nails, and the tablet of inscription, not, however, attached to any of the crosses. A noble lady of Jerusalem, sick unto death, touched two of them without effect; but, touching the third, was healed. Part of this cross having been framed in silver and placed in the new church, splinters of it were soon extensively sold. Yet, although "the whole world was at length filled with these splinters, the cross itself miraculously remained entire."

TRUFFLE, *Tuber*, a genus of fungi of the section *gasteromycetes*; globose, or nearly so; of a fleshy substance, with a distinct skin, the whole substance pervaded by a network of serpentine veins, which are the *hymenium*, and bear the spore-cases in minute cavities. The species are not numerous; they are very generally diffused in temperate parts of the world; they are subterranean, often found at the depth of a foot or more in the soil. Some of them are among the most highly valued of esculent fungi. The **COMMON TRUFFLE** (*T. cibarium*) is of a black color, and has a watery surface. It varies in size from that of a large plum to that of a large potato. On account of its agreeable flavor, it is used in the preparation of many dishes. It is common in the central and southern parts of Europe, chiefly in loose soils, in woods and pastures, as in the chestnut woods of France and Italy. In England, it occurs, pretty abundantly, in the downs of Wiltshire, Hampshire, and Kent. Other species, as *T. aestivum*, *T. rubum*, and *T. moschatum*, are found in some parts of France, Italy and other countries of Europe, and are sought after and used in the same manner as the common truffle. It has recently been discovered that the English species are more numerous than was formerly supposed; truffles have also been discovered in localities in the s. of England where their existence was formerly unknown. The gathering of truffles is the occupation of many persons in the places where they abound. They are dug up with a kind of hoe or pick. Dogs are trained to seek them, and readily discover by the scent the spot where they grow underground. The stirring of the soil in the gathering of truffles seems to increase its productiveness. No particular kind of dog is specially employed for truffle-seeking; but one of which the parents are truffle-dogs is preferred, as it is said to be more easily trained. In some parts of France, pigs are also trained to seek truffles. In Germany, the name **BLACK TRUFFLE** is given to the common truffle, and that of **WHITE TRUFFLE** to *rhizophagon album*, a species of a nearly allied genus, which has also been found in England. It grows half above ground, is of a whitish-red color, and is generally of the size of a large walnut. It is less aromatic than the common truffle, but is used in the same way. See *illus., MOSSES, ETC., vol. X.*

TRUJILLO. See **TRUXILLO**.

TRUL'LAN, the name (derived from the hall—*Gr. troullos*)—of the palace in which the fathers assembled) given to the council also called *quiniseat* (q.v.).

TRUMBULL, a co. in n.e. Ohio; 625 sq.m.; pop. '90, 42,373. Co. seat, Warren.

TRUMBULL, BENJAMIN, D.D., 1735-1820; b. Conn.; graduated at Yale, 1759; studied under Dr. Wheelock, founder of Dartmouth college; pastor of the Congregational church at North Haven, Conn., 1760, until his death. He served in the revolutionary army as chaplain and volunteer soldier. He published *A Plea in Vindication of the Connecticut Title to the Contested (Western) Lands*; *History of the United States to 1765*; *Twelve Discourses on the Divine Origin of the Scriptures* (1790).

TRUMBULL, HENRY CLAY, b. Conn., 1830; studied at Williston seminary, East Hampton, Mass.; missionary of the American Sunday-school union for Connecticut, 1858; ordained a Congregational minister, 1861; chaplain in the army for three years; missionary secretary of the American Sunday-school union for New England, 1865; removed to Philadelphia, 1875, and became editor of the *Sunday School Times*. He has published *The Sabbath School Concert*; *The Knightly Soldier*; *Childhood Conversion*; *The Captured Scout of the Army of the James*; *The Blood Covenant* (1885); *The Sunday School* (1888); *Principles and Practice* (1889); *Friendship the Master Passion* (1891); *Studies in Oriental Social Life* (1894).

TRUMBULL, JAMES HAMMOND, LL.D., b. Conn., 1821; educated at Yale college in the class of 1842. Feeble health prevented his entering professional life, and since 1847 he has been a resident of Hartford. From 1847 to 1852 and 1858-61 he was assistant secretary of state, and from 1861-65 secretary. He was among the foremost of American philologists, and a well known writer on historical subjects of local interest. He made a thorough study of the Indian tongues. Mr. Trumbull was the state librarian 1854-56; from 1849 to 1863 was secretary of the Connecticut historical society, and from 1863 its president until his death, Aug. 5, 1897. Among his many published writings are *The Public Records of Connecticut prior to the Union with New Haven Colony, May, 1665*; *Roger Williams's Key to the Indian Language*; *True Blue-Laws of Connecticut*; and many papers in *Notes and Queries*, in *The New England Historical and Genealogical Register*, and in other periodicals.

TRUMBULL, JOHN, 1750-1831; b. Conn.; passed his examination at Yale college at 7 years of age, though ill-health prevented his entering until 1763 graduated, 1767. In 1769, associated with Timothy Dwight, he wrote essays in the "Spectator" style for newspapers in Boston and New Haven. While a tutor in Yale college, 1771-73, he wrote the *Progress of Dullness*; was admitted to the Connecticut bar in the latter year; entered the office of John Adams in Boston; wrote political essays and *Elegy on the Times*. In Philadelphia, 1775, he published the first part of *M'Fingal*. He married the daughter of Col. Leverett Hubbard of New Haven; resided in Hartford, 1781; and completed *M'Fingal*, 1782. He published *Poetical Works* (2 vols., 1820, latest ed., 1864, with notes by B. J. Lossing). *M'Fingal* has been republished in a cheap edition (New York, 1881). Associated with Humphreys, Barlow, and Dr. Lemuel Hopkins he wrote *The Anarchiad*. He was in the legislature, 1792 and 1800; judge of the superior court, 1801-19; judge of the court of errors, 1808; treasurer of Yale college for several years. His daughter married Gov. Woodbridge of Michigan, and he resided with her in Detroit from 1825 till his death.

TRUMBULL, JOHN, American painter, son of Gov. Jonathan Trumbull (said to have been the original "Brother Jonathan"), of Connecticut, and brother of Gen. Jonathan Trumbull, aide-de-camp to Gen. Washington, was b. in Lebanon, Conn., June 6, 1756, was educated at Harvard college, and devoted himself to painting. He had completed two pictures, the "Battle of Cannæ," and the "Judgment of Brutus," at 19, when the war of the revolution broke out, and he joined the provincial army before Boston as adjutant of the 1st Connecticut regiment. The execution of drawings of the British works procured his appointment as aid to Washington, and soon after that of brigade-major. In 1776-77 he served under Gates and Arnold as adjt.gen.; but, offended with the action of congress respecting the date of his commission, he resigned and resumed the palette. In 1780 he came to London, via France, where he was making rapid progress under the instructions of sir Benjamin West, when, during the excitement occasioned by the execution of Maj. André, he was thrown into prison. The king, George III., promised West that his life should be spared, but he was kept eight months in prison, and then released on condition of leaving the kingdom. After the war he returned and resumed his studies. His "Priam receiving the Body of Hector," painted at this period, is in the gallery of the Boston Athenæum. In 1786 he produced the first of a series of modern historical and military works, the "Battle of Bunker Hill," followed by the "Death of Montgomery," "Sortie of the Garrison from Gibraltar," exhibited in London in 1789, and engraved by Sharp. He, this year, returned to America, painted several portraits of Washington, and secured likenesses of many of the prominent actors in the revolution; and in 1796 returned to England as secretary of legation to Mr. Jay. He was in England again from 1808 to 1815, painting industriously, but with little success. Returning then to America he was employed by congress to paint four large national pictures for the rotunda of the capitol at Washington—the "Declaration of Independence," "Surrender of Burgoyne," the "Surrender of Cornwallis," and the "Resignation of General Washington, at Annapolis, Dec. 23, 1783." These pictures are chiefly valuable as collections of portraits. He afterward completed a gallery of all his historical pictures, 57 in number, on a smaller scale, which became the property of Yale college, and has great historical value. He was the president of the American Academy of Fine Arts from its foundation in 1816, until the formation of the National Academy in 1825; and died in New York, Nov. 10, 1843.

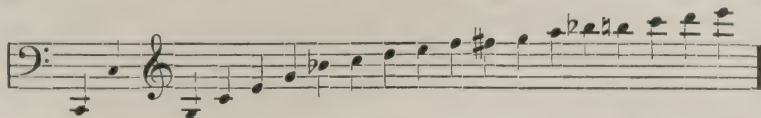
TRUMBULL, JONATHAN, LL.D., 1710-85; b. Conn.; graduated at Harvard in 1727. He studied theology, but in 1731 went into business with his father. In 1733 he entered the Connecticut assembly, of which he was elected speaker in 1739. He was assistant judge of the superior court; chief judge 1766-69. He was deputy governor in 1767-68; and governor, 1769-83, when he resigned. He was active in the cause of the colonists in the disputes which led to the revolution, refused to take the oath to execute the stamp act, and during the revolution was a constant and trusted adviser of Washington, whose familiar reference to him as "Brother Jonathan" may have originated the application of that name to the personification of America—a typical American.

TRUMBULL, JONATHAN, 1740-1809; b. Conn.; graduated at Harvard, 1759. He was speaker of the Connecticut legislature at the beginning of the revolution; paymaster in the army, 1775-78; and, later, secretary and aid to Washington. He served in congress from 1789 to 1795, and as speaker for the last four years; was U. S. senator in 1795; and lieutenant-governor of Connecticut, 1796-98.

TRUMBULL, JOSEPH, 1782-1861; b. Conn.; graduated at Yale, 1801; studied law and began practice in Hartford, 1804, retiring in 1828. He was for some years a member of the legislature; member of congress in 1834; and was elected governor of Connecticut in 1849.

TRUMBULL, LYMAN, b. Conn., 1813; educated at Colchester academy; principal of an academy at Greenville, Ga.; studied law, and admitted to the bar, 1837; settled at Belleville, Ill.; member of legislature, 1840; secretary of state, 1841-42; justice of supreme court of Illinois, 1848-53; member of congress, 1854; senator of United States, 1855; re-elected in 1860 and 1866. Formerly a leading Republican, he voted against the impeachment of President Johnson, and thenceforth acted with the Democratic party. He died June 25, 1896.

TRUMPET, a musical instrument of great antiquity, which, in its present form, consists of a tube 8 ft. long, less in diameter than the horn, doubled up in the form of a parabola, and sounded by a mouth-piece. It produces the following progression of sounds:



which the common truss fails to support a rupture comfortably, and in these cases various instruments, for the most part the property of special instrument-makers, are often serviceable; and the surgeon should be acquainted with the peculiarities of the pieces of apparatus known as the Mocmain lever truss, Coles's truss (with a spiral spring acting on the pad), Salmon and Ody's self-adjusting truss, Eggs's truss, etc. The patient must expect to find the truss somewhat uncomfortable for a week or two, but will soon get used to it. The skin of the part upon which it presses should be regularly washed and bathed with eau de Cologne or spirit, as, without this precaution, boils are apt to form on it.

TRUSS. See **CONSOLE**. Also the framework, composed of tie-beam, rafters, struts, etc., forming one of the principal supports of a roof.

TRUSSING, in ship-building, diagonal timbers or iron plates crossing the ribs internally, and consolidating the whole together. Iron is preferred to wood, as being less heavy and less bulky.

TRUST, in the law of England, is a confidence reposed in some other person touching land or goods for which the *cestui que trust*, or beneficiary, has no remedy except in the chancery division of the high court of justice. It means a species of divided proprietorship, whereby the trustee acts as a custodian or strong-box; and yet the benefit of the property is not his, but belongs to the *cestui que trust*. The person who creates the trust is sometimes called the *celui que trust*. As a general rule, all property, whether real or personal, may be made the subject of a trust, provided some policy of the law or statute does not prevent it. Trusts are most frequently created by a will; but they may be declared by word of mouth as regards personalty; while as to land, some writing is necessary. No particular words are necessary, but the intention of the party making the trust must be clear. Thus, in wills, a testator sometimes uses words which do not amount to an express trust, but speaks of his "wish and desire," or his "confidence" that the executor or trustee shall do certain things. These words are called in the law precatory trusts, but are enforced in the same way as more direct language, if no uncertainty exists as to the purposes or mode of carrying out the trust. But if a testator merely recommends an executor to "consider certain persons," "to be kind to them," or "to do justice to them," or "to make ample provision for them," etc.—such expressions are treated as too vague to be binding, and therefore the executor may disregard them, or use his own discretion. A trustee's is not a compulsory office, but gratuitous, and therefore he need not accept the office unless he pleases. But if he once accept, he is not at liberty afterward to renounce, unless the trust-deed contain a provision enabling him to do so, or the court of chancery for good reasons discharge him. A trustee cannot delegate the office to a third person, but continues personally bound to do his duty. Where there are several trustees appointed, the office is considered joint, so that if one dies, the survivors continue to exercise the office. As a general rule, all must join in doing any act; but if the trust is of a public nature, a majority may bind the minority. Each trustee is liable only for his own acts or defaults, and this is so even though, for form's sake, he join his co-trustees in signing a receipt, if he can show that he never received the money in point of fact. Nevertheless, when money lies in the hands of one trustee, the others ought not to be satisfied with his mere statement that the money has been invested by him, but should see that it is actually done. Another rule is, that a trustee is not allowed to make a gain of his office; and so jealous is an English court of this rule, that the trustees of a large estate are not even allowed to sport over the estate—at least so as thereby to keep any valuable right of that kind for their own pleasure. Hence, a trustee is personally liable if he trade with the trust funds, or buy shares in a joint-stock bank; for even though the trust-deed authorize this to be done, he will be liable to pay the debts of the trading concern, though far exceeding the amount of the trust funds. So, if a trustee is a solicitor, and does legal business for the estate, he will not be allowed to charge for his professional labors, but at most will be allowed only the costs out of pocket. It is seldom, therefore, that a trustee can get any benefit to himself from the trust estate, except in the rare case where the *cestui que trust* is dead without heirs, in which case the property will become the trustee's. This is, however, only so as to real estate; for if the trust estate consist of chattels, then, on the death of the *cestui que trust* without heirs or executors, the property goes to the crown, and not to the trustee. It is the duty of a trustee to keep the trust funds safe: and if they consist of moneys, then he ought to invest them in government stock, and not let the money lie unproductive. He is not entitled to lend the money on personal security, or in the shares of any private company; but he may invest in mortgages, unless he is forbidden by the deed or will. If there is, therefore, no power to invest in mortgages, the trustee must invest in three per cent consols, and a few other government securities. The trustees, as a general rule, must pay interest whether they invest the funds or not (if they have had time to invest) to the *cestui que trust*; and they must account for all the profits they make with the trust funds, whether rightly or wrongfully. If a trustee has grossly misconducted himself as to the trust funds, he will be charged 5 per cent interest, and sometimes with compound interest. A trustee is entitled to be indemnified for all the reasonable expenses or outlay attending the execution of the trust, but he must in general bear the loss of any mistake as to the law; but if there is any peculiar difficulty in carrying out the trust, he is entit-

led to take the opinion of, or even to throw the chief management upon, the court of chancery, as the only safe protection.

TRUST. In the United States within the last few years the term Trust has come to designate a form of commercial association between individuals or corporations engaged in manufacturing or producing the same commodity for the general purpose of regulating the amount of production, of establishing a uniform price, of diminishing the expense of competition, and of controlling the markets. The first important trade combination of this kind formed was the Standard Oil Trust (1881); this was followed in rapid succession by a Cotton-Seed Oil Trust, a Sugar Trust, a Tobacco Trust, a Lead Trust, and many others, until soon seventy-five or more of these Trusts sprang into existence. In the minor details of their plans and methods of operation these differed greatly; in more important features they also differed to some extent; but a typical plan, and that most generally adopted, may be described as follows: If any of the parties to the proposed transaction are not originally corporations their separate business concerns are severally incorporated; the stock of all the corporations is then handed over to trustees; these trustees issue in exchange for the stock thus deposited trust certificates; they also elect directors who have complete control of the affairs of the concerns associated in the Trust. The trust-certificates are transferable; dividends are issued *pro rata* according to the proportion of trust-certificates held by each party; the trustees are elected annually by the holders of certificates; the trustees, through the directors, possess almost unlimited power over the individual concerns—thus they may cause one concern to stop manufacturing altogether, or may limit the amount of its production; they may fix prices binding on all concerned; and they may regulate the manner of sales and the amount that may be put on the market at any given time. A somewhat similar method of organization has existed in England for many years, especially in mining operations, but its intention and operation have been less sweeping, and designed rather to facilitate mutual transactions than to destroy competition.

Very important questions connected with the subject of Trusts at once arose for the consideration both of legislatures and of courts. It is obvious that the main object sought by these associations is to prevent unlimited competition. The question at once occurs whether this object is so sought as to make the Trust a combination in restraint of trade so far as to become a proper subject for legal restriction or abolition. It is unquestioned that associations in restraint of trade are illegal if they constitute in fact a conspiracy against the public. The early English statutes on this subject were narrow, arbitrary, and quite ignored sound principles of political economy. Since these statutes have been rescinded the common law has more and more recognized the idea that a combination is not illegal which is only in a partial or limited sense in restraint of trade, and it has come to be held that a deliberate intent to injure the public must be shown to make such a combination illegal. Prof. Theodore W. Dwight in a careful article on the legality of Trusts (*Political Science Quarterly*, vol. 3), argues that such a combination is really a partnership, and that there is an undoubted right for individual producers to combine to regulate prices and diminish the expenses of unfair competition, provided that their union does not amount to a conspiracy to create a monopoly against the public welfare. He holds that a State cannot, by the mere assertion that such a combination is injurious, deprive those concerns of their constitutional right to combine, and that if state legislation so stigmatizes the Trusts the courts of highest resort will require direct proof that the agreement amounts to a conspiracy against the public welfare. Legislation by the United States Congress can, of course, affect the matter only when the element of foreign or of inter-State commerce is involved. The final appeal is to the provision of the United States Constitution that "no person shall be deprived of life, liberty, or property without due process of law." Those who hold that a Trust does form a conspiracy in restraint of trade, such as to make it the proper subject of legislation, argue that it tends to build up monopolies, to drive competitors out of business, to destroy fair competition, to increase the price of commodities unduly, to accumulate large fortunes in the hands of a few individuals and thus to build up an oligarchy, to corrupt legislation, and to throw large numbers of producing laborers out of employment. On the other hand, it is urged that Trusts will make cheaper production possible, will do away with multiplicity of officers and superintendents, will encourage invention, will prevent over-production, and—just as production by machinery has not only vastly increased the output of manufactures, but in the end has benefited those employed—so this higher form of organization will in the end tend to benefit all workers as well as the commercial public. Courts and legislatures, as well as popular opinion, have so far sustained the view that Trusts tend to monopoly, are a proper subject of legislation and are intended in the end to raise prices. Several states have passed laws bearing on the subject, and many important decisions have been made by the courts. Thus, in the case against the Chicago Gas Trust, the Supreme Court of Illinois laid down the following principle: "Whatever tends to prevent competition among those engaged in a public employment of business, impressed with a public character, is opposed to public policy, and, therefore unlawful. Whatever tends to create a monopoly is unlawful, as being contrary to public policy. . . . To create one corporation for the express purpose of enabling it to control all the corporations

engaged in a certain kind of business, and particularly a business of a public character, is not only opposed to the public policy of the State, but is in contravention of the spirit, if not the letter, of the Constitution."

The same principle has been maintained by other courts of last resort, and has been embodied in the legislation of several states. National legislation was adopted in 1890 on the subject. So great was the public interest in the topic that probably a dozen bills were before the two houses of Congress at that time; the bill which finally was accepted deals, of course, only with Trusts which attempt to control the manufacture and sale of articles that are the subject of inter-State commerce. It provides broadly "that every contract, combination in the form of Trusts or otherwise, or conspiracy in restraint of trade or commerce among the several States, or with foreign nations, is declared to be illegal," and that "every person who shall monopolize, or attempt to monopolize, or combine or conspire with any other person or persons to monopolize any part of the trade or commerce among the several states or with foreign nations, shall be deemed guilty of a misdemeanor." Such an offense is made punishable by a fine of not more than \$5000 or imprisonment of not more than a year, or both. Furthermore, any person injured by such a combination may obtain exemplary damages to the amount of threefold the loss sustained. Any property owned by such a combination, which is in the course of transportation from one state to another, may be seized by and forfeited to the United States. It will be seen that, after all, under this Act, it is ultimately necessary for the courts to define what does and what does not constitute such a conspiracy in restraint of trade as the Act forbids. So that in the end the question really turns upon the point we have already mentioned, as to how far a particular Trust is a legitimate partnership and when it becomes an illegal conspiracy. A quite different and very important point against the principle of the Trust was brought forward in the Sugar Trust case in New York state. Suit was brought by the Attorney-General against one of the corporations concerned in the Trust for the forfeiting of its charter. The decision of the trial judge—fully confirmed by the general term of the Supreme Court, and finally by the Court of Appeals, the highest court of resort in the state—held that the charter was forfeited because of the relinquishing by the corporation in question of its corporate responsibilities; by the passing of its stock to a body of "trustees" unincorporated and not responsible to the state the corporation had, it was affirmed, renounced its own legal duties as defined by its charter. The court also held that it was clearly shown that the purpose of the Trust was to make money by avoiding competition, by controlling the product and regulating the price, and that this was a conspiracy against the public interest. The importance and bearing of the first principle laid down will at once be seen; it is quite apart from the question of what is in restraint of trade and is based on the proper responsibilities of chartered corporations to the state and the irresponsibility of the unincorporated Trust, which nevertheless assumes enormous arbitrary power while claiming to be beyond the reach of the state authority. The decision was immediately followed by applications for the appointment of receivers for several of the concerns connected with the Sugar Trust. The establishing of these principles in connection with Trusts would seem to be a fatal blow to their continued existence, at least in New York state, and it would also seem to be probable that the principle of corporate responsibility here declared will be reiterated by the courts of other states. Indeed, a decision in Louisiana had previously declared that the American Cotton-Oil Trust was illegal and incompetent to transact business within that state, on the ground that it was really an unincorporated joint-stock association, while at the same time it improperly assumed the powers, privileges, and name of a corporation. This is not exactly on the lines of the New York decision, but still it shows the same distrust of an anomalous body with enormous powers, which cannot properly be classified either as a corporation or as a true common-law trust, and if we refuse to follow the opinion of the Louisiana court in considering the Trust as an unincorporated joint stock association, its anomalous character is only made still clearer. It is, however, true that the provisions of some of our States in regard to the granting of charters to corporations are lamentably loose, and there are already indications that the Trusts may still continue to hold their own when organized under the laws of such states. Action of this kind has already been taken in the States of New Jersey and West Virginia, and there is a decided popular demand for the revision in those states of the laws governing the incorporation of mercantile enterprises. Many economists who do not admit the right or desirability of the absolute prohibition of Trusts by legislation, yet admit that the relations to the public of such vast combinations of capital are such that careful supervision and judicious restriction are demanded. The responsibility of these combinations of producers has been well described by one writer on the subject, who says that the Trust "is neither a corporation nor a well-defined common law trust; it avoids the checks and safeguards which a wise public policy has thrown around corporate acts; its articles of agreement are secret and jealously guarded even from the investor himself; no charter nor statements need be filed for public inspection; no reports need be made or published; it may carry on any business it desires; the principles of *ultra vires* acts do not check it; no limit is placed by statute on its capital stock; no law prevents an increase or decrease of its trust-certificates; no qualifications are prescribed for its trustees; no tax is laid on its charter or fran-

chises or capital stock ; no limit is placed by the public on the powers and discretion of its trustees ; no publicity is given to its acts. It may move from state to state ; it may evade taxation and defy the powers of courts ; it wields vast sums of money, secretly, instantaneously, and effectively to accomplish its ends."

TRUST, CHARITABLE, differs from a private trust in that the beneficiaries under the former are either not exactly specified, or are a specified class whose individual members are unascertained. The statute 43 Eliz. gave the chancellor jurisdiction over charitable trusts, which he regulated not as a chancery judge, but as the representative of the crown. The statute named lawful objects of charity. Among the general classes of charitable trusts may be distinguished as supported by the courts, such trusts as are created for the public benefit, e.g., a part; and for the same reason trusts for the creation, endowment, etc., of institutions of education and science. Other good charitable trusts are for the benefit of the Christian religion, for the relief of the poor, the diseased, etc. The English courts, in their desire to carry out the wishes of the donor, applied what is called the *cy pres* doctrine; i.e., when the donor's scheme could not be carried out they would construct another scheme as near the original one as possible. The *cy pres* doctrine does not obtain in this country, where the statute 43 Eliz. has not been re-enacted. In some states the whole system of charitable trusts has been repudiated, and such a trust can take effect only through a corporation.

TRUSTEE, a person who has the legal estate in property, real or personal, for the benefit of another who has the equitable estate. In its widest sense the word is applied to any person who has an interest or power affecting any kind of property for the benefit of another, so that executors, administrators, assignees, directors of corporations, etc., are to a certain extent trustees. The power of a trustee cannot be delegated unless authorized by the instrument creating the trust; and when one trustee dies, the trust, as a rule, devolves upon the survivor or survivors. Trusts are cognizable only in equity; at law the trustee is regarded as the owner of the property. A trustee cannot become the purchaser of the property if it be sold, or make profit out of its use, or speculate with it. A new trustee will be appointed by the court. The trustee is chargeable with the trust fund and its income, and also for such income as he might have derived from the property by proper management. Trustees must act jointly, and cannot act separately like executors.

TRUSTEE PROCESS, established by statute in Massachusetts and some other New England states, whereby an attaching creditor may reach the goods, property, or credits, of a debtor which are in the hands of a third party. The process is by original writ, and the trustees, after service and entry, may testify as to the property alleged to be that of the debtor. The process is the same as that known at common law and in the statutes of most states as garnishment and garnisheeing. See GARNISH.

TRUXILLO, or **TRUJILLO**, a t. of Spain, province of Cáceres, on the great highway from Madrid to Badajoz, and 80 m. n.e. of the latter place. There are several churches and convents here. Pop. '87, 10,773, who are engaged chiefly in agricultural work. Truxillo is the birthplace of Pizarro, who was also buried here in the church of Santa Maria de la Concepcion.

TRUXILLO, a t. of Peru, province of Libertad, near the sea-coast, about 300 m. n.n.w. of Callao. The port of Truxillo is Huanchaco, about 8 or 9 m. to the n.w., from which considerable quantities of rice and spices are exported. Pop. '89, about 11,000. Truxillo was founded in 1535 by Pizarro, who named it after his birthplace in Spain.

TRUXTUN, THOMAS, 1755-1822; b. N. Y.; was capt. of a privateer during the revolution. He was appointed capt. in the U. S. navy in 1795, and four years later, in command of the frigate *Constellation*, captured the French frigate *L'Insurgente*, which lost 29 killed and 41 wounded. The *Constellation* lost but 1 killed and 3 wounded. In 1800 the *Constellation* fought the French frigate *La Vengeance*, which was disabled, with a loss of 50 killed and 110 wounded. The *Constellation* lost 14 killed and 25 wounded. He was high sheriff of Philadelphia, 1816-19.

TRYGON. See STING RAY.

TRYON, WILLIAM, LL.D., 1725-88; b. Ireland; an officer in the British army. He was made lieutenant-governor of North Carolina in 1764; and governor on the death of Gov. Dobbs the next year. During his administration he put down the revolt of the so-called "regulators." He became governor of New York in 1771, and resigned in 1778. He was made a maj. gen in 1777. He made himself generally detested by his severity, and by the ravages committed during his expedition to Connecticut, where he burned Danbury and other towns.

TSARITSINE. See ZARITZIN.

TSARSKOË SE'LO (i.e., imperial town), a t. of Russia, in the province of St. Petersburg, and 15 m. s. of the city of that name. It is the royal residence and favorite resort of the imperial family. The carriage road from the capital to this town was constructed by the empress Catharine II., but the *route* now preferred is that of the railroad—the first laid down in Russia. The population is about 16,000.

TSCHAIKOWSKY, PETER ILJITSCH. Russian composer, born at Wotkinsk, in the district of Perm, Russia, Dec. 25, 1840. After studying law in St. Petersburg, he served in the ministry of justice, from 1859 on, until, yielding to his musical tastes, he resigned his office, and entered the recently established conservatory of Rubenstein. He completed his studies in 1866, and after gaining a prize medal for a cantata on Schiller's poem *An die Freude*, taught composition at the conservatory of Moscow until 1877, since which time he lived alternately in Italy, Switzerland and Russia, supported by his musical compositions and by an honorary pension from the czar. His most noteworthy works are: the operas *Wakula the Smith*; *The Maid of Orleans* (1881); *Mazeppa* (1882); *The Enchantress* (1887); *Piquedame* (1890); *Iolanthe* (1893); 6 symphonies, the most familiar of which is the so called *Pathétique*, 3 string quartets, 2 piano concertos, a violin concerto, sonatas, songs, etc. He died of cholera in St. Petersburg, Nov. 6, 1893.

TSCHIGORIN, MICHAEL IWANOVITCH. Russian chess-player, was born in Russia, Oct. 31, 1850. Long ago he was considered the chess champion of his native country, having beaten Schamoff, Alapin, and others. His first appearance in an international tournament was at Berlin, Germany, in 1881, when he tried for third and fourth prizes with the great master, Winawer, and astonished the chess world by his bold and brilliant play. In 1882, Tschigorin competed in the Vienna tournament, and although he failed to secure a prize, he won even games with Steinitz, Winawer, Blackburne, Zuckertort, and Mackenzie. In 1883, in London, he won fourth prize, having defeated Steinitz twice, in their personal encounter. The victory of St. Petersburg over the British Chess Club in their correspondence match, almost exclusively due to Tschigorin, was one of the greatest feats of chess. His match with Steinitz in Havana, Cuba, and his success in the Sixth American Congress, were also notable triumphs. He was beaten in England in 1895, and in St. Petersburg in 1896.

TSCHUDI, an ancient and noble family in the Swiss canton of Glarus, several members of which have distinguished themselves as authors, statesmen, and warriors. The two following are the most notable of the Tschudi: GILLES, or AEGIDIUS (b. 1505, died 1572), who was active on the Catholic side during the struggles of the reformation in Switzerland, and in consequence was forced for a time to leave his native canton (1562), but was permitted to return two years afterward. He was a prolific writer, not less than 166 works of his, in print or in MS., being known. The most valuable is a *History of Switzerland* (Basel, 2 vols., 1734). See Fuch's *Aegid. Tschudi's Leben und Schriften* (2 vols., St. Gall, 1805). To the same family belongs JOHANN JAKOB VON TSCHUDI, the eminent traveler and naturalist, b. at Glarus, July 25, 1818. After completing his studies at Leyden and Paris, he undertook (1838) a voyage round the world; but circumstances restricted his design to an investigation into the natural history and ethnography of Peru, where he remained for five years. On his return to Europe (1843), he wished to join the Arctic expedition of sir John Franklin, but was again prevented by circumstances from doing so, and finally settled in Austria. In 1868 he was made Swiss ambassador at Vienna. Tschudi's principal works are: *Peru: Reisekizzen aus den Jahren 1838-42* (2 vols., St. Gall, 1844); *Untersuchungen über die Fauna Peruana* (St. Gall, 1844-47, with 76 plates); the splendid work, *Antigüedades Peruanas* (Vien, 1851), executed in conjunction with don Mariano Eduardo de Rivera (Eng. trans. 1854); *Die Kechuasprache* (2 vols., Vien, 1853), containing a grammar and dictionary of the Peruvian language; and his *Reisen durch Südamerika* (5 vols., 1868). He d. 1889.

TSENG, MARQUIS, 1839-90, Chinese statesman, son of Tseng-Kwo-Fan, whom he accompanied in the war against the Taipings. In 1879 he was sent as ambassador to Russia, and was instrumental in bringing about an important treaty between the two countries. He was afterwards ambassador to Great Britain and to France, and between 1882 and 1884 conducted the negotiations in respect to the French rule over Tonquin. He was again ambassador at London and St. Petersburg, but returning to China in 1886, became grand secretary and president of the admiralty board.

TSETSE, *Glossinia morsitans*, a dipterous insect, which is a terrible pest of some parts of s. Africa. It is not much larger than the common house-fly, of a brown color, with four yellow bars across the abdomen. The wings project considerably beyond the abdomen. It is remarkably alert, at least during the heat of the day, and dexterously avoids any attempt to catch it with the hand. "Its peculiar buzz," Livingstone says, "can never be forgotten by the traveler whose means of locomotion are domestic animals." Its bite is almost certain death to the ox, horse, and dog. Livingstone, in one of his journeys, lost 43 fine oxen by it. Yet the bite is harmless to man, to the mule, the ass, and apparently to antelopes and the other wild animals of the country. The proboscis is adapted for piercing the skin, and the fly lives by sucking blood. At first no effect is perceived; but in a few days after an ox has been bitten by the tsetse, the eyes and nose begin to run, "the coat stares as if the animal were cold," a swelling appears under the jaw, and sometimes at the navel, emaciation and flaccidity of the muscles ensue, purging, sometimes staggering and madness, and finally death. On dissection, the cellular tissue under the skin is found to be injected with air, as if a quantity of soap-bubbles were scattered over it.—Livingstone's *Travels*.

TSONG-KHA-PA (orthographically, *tTsong kha pa**) is the great reformer of Lamaism

* The small letters prefixed to the initials of the Thibetan words in this article are not pronounced.

(q.v.), who, by his co-religionists, was considered to be an incarnation of the Bodhisat-twa Amitâbha, or, according to others, of Manjus'ri or Vajrapân'i, and after his death, was canonized by the Lamaist church. He was born in the middle of the 14th c. after Christ, in the country Amdo, in the place where now the celebrated convent ssKu'bum is situated. According to the legends of Thibet, he was conceived by his mother in a supernatural, immaculate manner: he was born with a white beard, and from the day of his birth expressed himself clearly and fluently, and discoursed profoundly on religious matters. In his third year he resolved to renounce the world. His mother accordingly cut off his long beautiful hair; but when it fell to the ground, a tree grew up—which is still in a court-yard of the convent of ssKu'bum, and was seen and described by the missionaries Huc and Gabet, in the year 1845. The leaves of this tree are covered with one or more letters of the sacred Thibetan alphabet. He now lived retired from the world, entirely devoting himself to prayer and contemplation. A learned Lama from the west, "with a long nose and bright eyes," came to settle about this time in Amdo, and seems to have become his teacher. After his death, Tsong-kha-pa set out to Thibet, and traveled until he came near Lhasa, where a god bade him halt. Here he studied assiduously the Buddhistic law, and soon became convinced of the necessity of reforming the actual worship and discipline of the Lamaist church. When his teaching attracted a great number of pupils, and when these, in order to distinguish themselves from the followers of the old system, who wore a red cap, assumed as their mark a yellow cap, the head of the Lamaist church resolved to stop the innovator in his dangerous course, and accordingly summoned him to his presence. But Tsong-kha-pa did not deign to obey his command. Thereupon, the great Lama repaired in person to the bold monk; but when he entered the cell of Tsong-kha-pa, his red cap fell off—and when he began to descant on the superiority of the old system, Tsong-kha-pa—seated and turning the beads of his rosary—without raising his eyes, cried out, "Miserable! I hear the groans of a creature whom thou murderest!" And, in fact, unmindful of the first commandment of the Buddhist law, the great Lama was busy crushing a louse which he had caught. Confused, he fell at the feet of Tsong-kha-pa; and from this moment no further resistance could be made to his reforms. Such is the legend; but independently of it, history tells us that the influence which Tsong-kha-pa exercised on the reform of Lamaism, though not miraculous, was very powerful, such as to reduce the wearers of the red cap to a small minority. His reputation having widely spread, thousands of pupils thronged round him to hear and to adopt his doctrine. In consequence, in 1407 or 1409, he founded the convent dGa' lDan; and when this could no longer contain the number of his adherents, two other convents, which together, it is said, are now peopled with 30,000 monks of the yellow cap. His works are numerous and voluminous; the most celebrated of them is the *Lam nim chhen po*, or "The great Step-road toward Perfection," consisting of three parts, viz., "the road of the little, middle, and great man." The sect which he founded, and which adopted the yellow cap, is called dGe lugss pa, or the sect of virtue; and the principal reforms which he introduced into the Lama religion as it then existed, were compulsory celibacy for the monks—the Lamas of the old doctrine being conditionally permitted to marry—prohibition of sorcery and necromancy—which were extensively practiced by the wearers of the red cap—and the institution, at fixed periods, of religious exercises and of common prayers, and, consequently, of regular meetings of the whole community. His greatest achievement, however, was the organization of the Lamaist hierarchy as it still exists. See LAMAISM. He died in 1419.

T-SQUARE, an instrument consisting of two arms, the stock and the blade, used for drawing parallel lines in carpentry, architecture, etc.

TSURUGA, a Japanese sea-port on the w. side of the main island, on Tsuruga bay; pop. '92, 12,000. It is connected with Osaka and Kioto by railroad, and with lake Biwa by canal. Its harbor is the best on the w. coast, and it has a large trade. The surrounding country is rich in tea, silk, rice, etc.

TSUSHIMA. A pair of islands which command the southern entrance to the sea of Japan, between parallels 34 and 35 of n. latitude. Area, 361 sq. m.; pop. '95, 32,135. The channel which divides the two islands varies in width from 16 yds. to many miles. The southern island, which is about 125 m. in circumference, contains many mountains and deep ravines, and the city of Fukuye. The northern island, which has a coast line of about 400 m., is noted for its beautiful bays, of which the chief is Waniura, 32 m. from Fusan, the chief port of Korea. The people are mostly fishermen.

TUAM, an inland market-t. and episcopal seat of Galway, Ireland, is situated on the Harrow, a branch of the Clare, 19 m. n.e. of Galway, with which it is connected by a branch from the Midland Great Western railway. The pop. in 1891 was 3012. It has been an archiepiscopal see since the 12th c., and continues to have this rank in the Roman Catholic church; but in 1839 the province was united in the Established church with the archbishopric of Armagh, of which Tuam is now a suffragan see.

TUARIKS. See BERBERS.

TUBA, a name given to the bass instruments of the Saxhorn family, also called Bombardons. They are supplied with valves, large masterpieces, and require loose

embouchure. Tubas are made in many keys, and as they are played from the notes as written they require no special transposition. Their introduction into the orchestra is due to Wagner, who obtained fine effects through them. Tuba, Tuba mirabilis, and Tuba major are names given to a high-pressure reed-stop of eight-foot-pitch on the organ.

TUBER, in botany, a subterranean stem, thickened by the approximation of the nodes and swelling of the internodes, with latent buds along its sides ready to produce new plants in the succeeding year. The cellular tissue is unusually developed, and in general a large quantity of amylaceous matter is accumulated, whence the economical value of tubers, as in the potato, the Jerusalem artichoke, and the arrow-root. Tubers are capable of being employed for the propagation of the plant, by division into portions, each containing an *eye* or bud, according to the usual mode of planting potatoes. Like bulbs and corms, they may be regarded as a store laid up for the plant itself, that it may spring with new vigor in a new year. Like them, also, and even in a greater degree, they are in many cases a provision for the use of man. The most valuable tubers are those already named, but many others are used in different parts of the world. See *OXALIDÆE*, *TROPÆOLUM*, etc.

TUBERCLE is a word that has been employed by pathologists of different epochs in very different senses. The older writers employed the term merely to express an external form; and everything was called a tubercle which manifested itself in the form of a small knot. Without entering into any discussion of the views of Laennec (who asserted that tubercle presented itself in the lungs under two different aspects—namely, as *tubercular infiltration* and *tubercular granulation*, and thus opposed the old knot-theory), of Lebert (who was the first accurately to describe the so-called “tubercle-corpuscles”), of Reinhardt (who, with many others, holds that tubercle is nothing more than one of the forms presented by inflammatory products when undergoing transformation, and that all tubercular matter is really inspissated pus), or of Rokitsansky, Van der Kolk, Williams, Walsh, Paget, and other eminent pathologists, we shall briefly give the theory of tubercle which Virchow adopts in his *Cellular Pathology*, and which is perhaps more generally adopted than any other. Virchow holds that tubercle is a granule or a knot, and that this knot constitutes a new formation, which from the time of its earliest development, is necessarily of a cellular nature, and like all other new formations, has its origin in connective tissue. When this new formation has reached a certain degree of development, it constitutes a minute knot; and if it is near the surface, it forms a little protuberance, its mass consisting of small nucleated cells. The great characteristic of this formation is its extreme richness in nuclei, of which, at a first glance, it seems entirely to consist. But upon isolating the constituents of the mass, either very small cells with a single nucleus are seen, or larger cells with twelve, twenty-four, or even more divided nuclei are observed, these nuclei being always small, and having a homogeneous and somewhat shining appearance. In its minute nuclei and very small cells, tubercle contrasts strongly with the large and comparatively gigantic corpuscles of some of the more highly organized forms of cancer. To use the expressive language of Virchow, “tubercle is always a pitiful production, from its very outset, miserable.”

Tubercle is usually described as occurring in two principal forms, the first being distinguished as the yellow, and the latter as the gray; the latter is also known from its ordinary size as the milary tubercle. The latter is the tubercle to which the above description of Virchow applies, the yellow being the same in a state of fatty degeneration or cheesy metamorphosis. In consumption, we often find large masses of softening tubercular matter in the lungs and elsewhere. These large masses are formed by the aggregation of smaller masses, which have coalesced as the deposit continued to increase. The intervening tissues at length suppurate, and thus soften and break down the tubercular matter, and lead to its expulsion; for a process of ulceration having been established into the surrounding tissues, the softened tubercle is brought up by coughing, and a cavity or *vomica* is formed at the spot previously occupied by the morbid deposit. It is a remarkable fact, and one of the greatest importance in the diagnosis of consumption, that tubercles, when they affect the lungs, are almost invariably deposited in the upper lobes. When it is stated that consumption is only one manifestation of scrofula (q.v.), and that tubercle is the essential element of scrofula, one sees that the importance of this subject cannot be overrated.

TUBERCULIN or **TUBERCULINE**, the name commonly given to the preparation used by Dr. Robert Koch (q.v.) in his treatment of tuberculosis, and also known as “lymph,” “paratoloid,” and “Kochine.” Such knowledge of this preparation as is possessed by physicians in general, is based upon the published statement made by Dr. Koch himself on Jan. 15, 1891. The essential portions of the statement are as follows:

“Before going into the remedy itself, I deem it necessary, for the better understanding of its mode of operation, to tell briefly the way by which I arrived at the discovery. If a healthy guinea-pig be inoculated with the pure cultivation of German kultur of tubercle bacilli, the wound caused by the inoculation mostly closes over with a sticky matter and appears in its early days to heal. Only after ten to fourteen days a hard nodule presents itself, which, soon breaking, forms an ulcerating sore which continues until the animal dies.

"Quite a different condition of things occurs when a guinea-pig already suffering from tuberculosis is inoculated. An animal successfully inoculated from four to six weeks before is best adapted for this purpose. In such an animal the small indentation assumes the same sticky covering at the beginning, but no nodule forms. On the contrary, on the day following or the second day after the inoculation, the place where the lymph is injected shows a strange change. It becomes hard and assumes a darker coloring, which is not confined to the inoculation spot, but spreads to the neighboring parts until it attains a diameter of from .05 to 1 centimetre. In a few days it becomes more and more manifest that the skin thus changed is necrotic, finally falling off, leaving a flat ulceration which usually heals rapidly and permanently without any cutting into the adjacent lymphatic glands.

"Thus the injected tubercular bacilli quite differently affect the skin of a healthy guinea-pig from one affected with tuberculosis. This effect is not exclusively produced with living tubercular bacilli, but is also observed with the dead bacilli, the result being the same whether, as I discovered by experiments at the outset, the bacilli are killed by a somewhat prolonged application of a low temperature or boiling heat or by means of certain chemicals. This peculiar fact I followed up in all directions, and this further result was obtained—that killed pure cultivations of tubercular bacilli, after being diluted with water, might be injected in great quantities under healthy guinea-pigs' skin without anything occurring beyond local suppuration.

"Tuberculous guinea-pigs, on the other hand, are killed by the injection of very small quantities of such diluted cultivations. In fact, within six to forty-eight hours, according to the strength of the dose, an injection which is not sufficient to produce the death of the animal may cause extended necrosis to the skin in the vicinity of the place of injection. If the dilution is still further diluted until it is scarcely visibly clouded, the animals inoculated remain alive, and a noticeable improvement in their condition soon supervenes. If the injections are continued at intervals of from one to two days, the ulcerating inoculation wound becomes smaller and finally scars over, which otherwise it never does; the size of the swollen lymphatic glands is reduced, the body becomes better nourished, and the morbid process ceases, unless it has gone too far, in which case the animal perishes from exhaustion. By this means the basis of a curative process against tuberculosis was established.

"Against the practical application of such dilutions of dead tubercle bacilli there presents itself the fact that the tubercle bacilli are not absorbed at the inoculation points, nor do they disappear in another way, but for a long time remain unchanged and engender greater or smaller suppurative foci. Anything, therefore, intended to exercise a healing effect on the tuberculous process must be a soluble substance which would be lixiviated to a certain extent by the fluids of the body floating around the tubercle bacilli, and be transferred in a fairly rapid manner to the juices of the body, while the substance producing suppuration apparently remains behind in the tubercular bacilli, or dissolves but very slowly. The only important point was, therefore, to induce outside the body the process going on inside, if possible, and to extract from the tubercular bacilli alone the curative substance.

"This demanded time and toil, until I finally succeeded with the aid of a 40 to 50 per cent. solution of glycerine in obtaining an effective substance from the tubercular bacilli. With the fluid so obtained I made further experiments on animals, and finally on human beings. These fluids were given to other physicians to enable them to repeat the experiments. The remedy which is used in the new treatment consists of a glycerine extract, derived from the pure cultivation of tubercle bacilli. Into the simple extract there naturally passes from the tubercular bacilli, besides the effective substance, all the other matter soluble in 50 per cent. glycerine. Consequently it contains a certain quantity of mineral salts, coloring substances, and other unknown extractive matter. Some of these substances can be removed from it tolerably easily. The effective substance is insoluble in absolute alcohol. It can be precipitated by it, though not, indeed, in a pure condition, but still combined with the other extractive matter. It is likewise insoluble in alcohol. The coloring matter may also be removed, rendering it possible to obtain from the extract a colorless, dry substance containing the effective principle in a much more concentrated form than the original glycerine solutions. For application in practice this purification of the glycerine extract offers no advantage, because the substances so eliminated are unessential for the human organism. The process of purification would make the cost of the remedy unnecessarily high.

"Regarding the constitution of the more effective substances, only surmises may, for the present, be expressed. It appears to me to be derivative from albuminous bodies, having a close affinity to them. It does not belong to the group of so-called 'ox-albumens, because it bears high temperatures, and in the deslyser goes easily and quickly through the membrane. The proportion of the substance in the extract to all appearance is very small. It is estimated at a fraction of one per cent. which, if correct, we should have to do with a matter whose effect upon organisms attacked with tuberculosis goes far beyond what is known to us of the strongest drugs.

"Regarding the manner in which the specific action of the remedy on tuberculous issue is to be represented, various hypotheses may naturally be put forward. Without wishing to affirm that my view affords the best explanation, I represent the process

myself in the following manner : The tubercle bacilli produced when growing in living tissues, the same as in artificial cultivations, contain certain substances which variously and notably unfavorably influence living elements in their vicinity. Among these is a substance which, in a certain degree of concentration, kills or so alters living protoplasm that it passes into a condition that Weigert describes as coagulation necrosis. In tissue thus become necrotic the bacillus finds such unfavorable conditions of nourishment that it can grow no more, and sometimes dies. This explains the remarkable phenomenon that in organs newly attacked with tuberculosis, for instance in guinea-pigs' spleen and liver, which then are covered with gray nodules, numbers of bacilli are found, whereas they are rare or wholly absent when the enormously enlarged spleen consists almost entirely of whitish substance in a condition of coagulation necrosis such as is often found in cases of natural death in tuberculous guinea-pigs.

"The single bacillus cannot, therefore, induce necrosis at a great distance, for as soon as necrosis attains a certain extension the growth of the bacillus subsides, and therewith the production of the necrotizing substance. A kind of reciprocal compensation thus occurs, causing the vegetation of isolated bacilli to remain so extraordinarily restricted, as, for instance, in lupus and scrofulous glands. In such cases the necrosis generally extends only to a part of the cells, which then, with further growth, assumes the peculiar form of giant cells. Thus, in this interpretation, follow first the explanation Weigert gives of the production of giant cells. If now one increased artificially in the vicinity of the bacillus the amount of necrotizing substance in the tissue, the necrosis would spread a greater distance. The conditions of nourishment for the bacillus would thereby become more unfavorable than usual. In the first place, the tissue which had become necrotic over a larger extent would decay and detach itself, and where such were possible would carry off the inclosed bacilli and eject them outwardly, so far disturbing their vegetation that they would much more speedily be killed than under ordinary circumstances. The remedy contains a certain quantity of necrotizing substance, a correspondingly large dose of which injures certain tissue elements even in a healthy person, and perhaps the white blood corpuscles or adjacent cells, thereby producing fever and a complication of symptoms, whereas, with tuberculous patients, a much smaller quantity suffices to induce at certain places—namely, where tubercle bacilli are vegetating, and have already impregnated the adjacent region with the same necrotizing matter, more or less extensive necrosis of the cells, with the phenomena in the whole organism which result from and are connected with it. Thus, for the present, at least, it is impossible to explain the specific influence which the remedy, in accurately defined doses, exercises upon tuberculous tissue and the possibility of increasing the doses with such remarkable rapidity, and the remedial effects which have unquestionably been produced under not too favorable circumstances."

As to the practical results of Prof. Koch's discovery, the reader is referred to the article CONSUMPTION.

TUBEROSE, *Polianthes*, a genus of plants of the natural order *Liliaceæ*, having a funnel-shaped perianth, with 6-parted limb, stamens inserted in the tube of the corolla, a superior capsule, and flat seeds. The COMMON TUBEROSE, (*P. tuberosa*) has rounded bulbous root; a cylindrical, upright, unbranched stem, 3 or 4 ft. high; both root-leaves and stem-leaves sword-shaped, and very acute; flowers spiked and somewhat aggregated, large, pure white, the tube a little curved. The plant grows well in the s. of Europe, but only bears the open air in more northern climates during summer. The roots are a considerable article of export from the s. to the n. of Europe; the plant being in high esteem for the beauty and fragrance of its flowers, the odor of which is most powerful after sunset, and has been known to cause headache and asphyxia in a room. The fading flowers emit, in certain states of the atmosphere, an electric light and sparks. The flowers yield an essential oil, which is used by perfumers. The native country of the tuberose is not quite certain. Another species, *P. gracilis*, is found in Brazil, and has been supposed to be the original of the cultivated plant. The tuberose has been known in Europe for about three centuries.

TUBE-WELL is an American contrivance, introduced into England in 1867, having for its object the obtaining of a small supply of water in a very short space of time by the application of a limited amount of manual power.

During a trial of this apparatus in the cricket-ground at Old Trafford, Manchester, the tube was sunk to a depth of 10 ft. in 22 minutes, and water had been reached in even less than that time. Such a form of well, it is considered, will be free from the liability of received dirty surface-water; and no accident is possible from foul air or from the falling in of the sides. A well 15 ft. deep was sunk in one hour in the botanical gardens at Manchester, and excellent water reached. Another was sunk in the grounds of St. Cloud in half an hour, and pumped up water at the rate of 20 liters (18 quarts) per minute. The inventor accompanied the American federal army, and enabled the troops frequently to obtain water by the aid of these pumps. On one occasion, to try the capabilities of the tube, he sank one to a depth of 150 ft. at Ithaca, in New York state. Tube-wells were sent out with the British military force to Abyssinia.

TUBICOLÆ, an order of *annelida* (q.v.).

TUBICOLIDÆ, or **GASTROCHÆNIDÆ**, a family of lamellibranchiate mollusks, remarkable for the calcareous tube into which the proper shell is cemented. Examples are noticed in the articles **ASPERGILLUM**, **CLAVAGELLA**, and **GASTROCHÆNA**.

TÜBINGEN, an important t. of Württemberg, in the circle of the Black forest, 20 m. s.w. of Stuttgart, is situated on the Neckar, at the influx of the Steinlach, in one of the most beautiful and fertile districts of the Oberland. Tübingen is an old place, irregularly built, with steep and narrow streets in the main; but the suburbs, especially round about the new university, are very pleasant. Westward from Tübingen is the Schloss, built by duke Ulrich in 1535. Book-printing, book-selling, working in copper, weaving, bleaching, and the manufacture of surgical and physical instruments, are important. Tübingen has three Protestant churches and one Catholic church, a Bible society, a chamber of manufactures, and various educational and benevolent institutions. But it owes its celebrity wholly to its university. Founded in 1477 by Eberhard im Bart, afterward first duke of Württemberg, the university of Tübingen soon became a distinguished seat of learning, enjoyed for a time the presence of Reuchlin (q.v.), and Melancthon (q.v.), and continued to flourish long after the reformation had firmly established itself. The thirty years' war, however, fatally checked its prosperity; and it was not till the early part of the present century that it began to reacquire a reputation. Under Baur (q.v.) it became celebrated as a school of historico-philosophical theology, known as the "Tübingen school," the influence of which on the development of religious thought has been very great, and is likely to prove permanent. The university has six faculties, and in 1895 had 81 professors and teachers, a library of 300,000 vols. (located in duke Ulrich's Schloss), and was attended by 1262 students. Connected with it are an anatomical and physical institute, a botanical garden, a chemical laboratory, a collection of zoology and comparative anatomy, one of minerals, one of coins and antiquities, fencing, gymnastic, and swimming-schools, etc. Pop. of Tübingen '95, 13,989.

TUBULAR BRIDGE. The advantages of the tube for carrying a level roadway across a large span were brought into general notice by Robert Stephenson, engineer of the Chester and Holyhead railway, in the construction of the bridges to carry that railway across the Menai strait. It was required by the admiralty that these bridges, called the Britannia and Conway, should be constructed, so as not to interfere with the navigation, with clear spans of upward of 400 feet. The largest arched spans that had been previously constructed did not exceed 240 ft.; and suspension-bridges not being suitable for heavy and rapid railway traffic, the engineer was obliged to devise some new form, which should conform to the stipulated conditions. Mr. Stephenson having decided upon the tubular form, proceeded, in conjunction with Mr. Fairbairn, to make an elaborate series of experiments on tubes, to determine the most suitable arrangement of the wrought iron of which they were to be composed. They found that a rectangular tube, of which the top and bottom were cellular, gave the greatest strength with the least material. The span of the Conway tube was 400 ft.; while the tubular part of the Britannia bridge consisted of two spans of 460 ft., and two of 230 ft. each in the clear. The foundation-stones of these bridges were laid in 1846 and 1847 respectively. Since that time, many important bridges have been constructed on this principle. One of the largest and most important is the Victoria bridge, over the St. Lawrence, near Montreal, in Canada. The total length of this bridge is 9,144 ft., or nearly 1½ miles. It is built in 24 spans, of from 242 to 247 ft. each, and one of 330 feet. The greatest depth of the river is 22 ft., and the average rate of the current 7 m. per hour. The bottom of the center tube is 60 ft., and at the abutments the bottom is 36 ft. above the water, so that there is a rise of 1 in 130 in the roadway toward the center of the bridge. An idea of the stupendous nature of this structure may be formed from the facts that 9,000 tons of iron were used in the tubes, and 1½ millions of rivets; also that the total surface of iron was 32 acres; and as it received 4 coats of paint, the total painting was 128 acres. There were 2,713,095 cubic ft. of masonry, and 2,280,000 cubic ft. of timber in the temporary works, dams, etc.; and upward of 3,000 men were employed. The first stone was laid July 20, 1854, and the first train passed over on Dec. 17, 1859. The total cost was £7,000,000, or about \$285 per lineal foot. Notwithstanding the success of these structures, the tubular form has been to a great extent superseded in recent structures by the lattice or trellis. This has arisen from the great saving in the material of which the sides are composed, effected by the open lattice-work, as compared with the solid plated side of the tube. By the lattice arrangement, the material is more capable of arrangement in the direct line of the strains; and the section of the lattice-bars can be accommodated to the strain, so that there shall be no material which is not carrying its due share of the load. The first large structure of this nature was the Boyne viaduct, on the Dublin and Belfast Junction railway. Mr. Barton, the designer of this structure, in a notice of this bridge, gives the relative weight in the sides of the different forms of girders, neglecting the weights of the top and bottom, which are the same in every case, as follows: ordinary tubular girder, 100; girder as adopted in great exhibition, 117; Warren's girder (angle of bars 60°), 73; lattice girder (angle of bars 4.5°), 67. Besides this considerable saving in material, the facilities this form gives for repairs and painting, and the exposure of a smaller surface to the wind, are additional reasons for its preference. See BRIDGE.

TUCKAHOE' is the Indian name of a curious vegetable product of underground growth, somewhat resembling the truffle, but not to be classed with the *fungi*. Its composition is almost entirely of *pectine*, and in southern states it is used as an article of

diet in sickness to take the place of arrowroot. It is found in balls varying from an inch to 8 in. in diameter, and is entirely devoid of cellular structure. Its origin and method of growth are unknown.

TUCKAHOE, a magisterial dist., Henrico co., Va. Pop. '90, 4875.

TUCKER, a co. in n.e. West Virginia; 500 sq.m.; pop. '90, 6459, chiefly of American birth, with colored. Co. seat, Parsons.

TUCKER, ABRAHAM, an English author whose reputation falls far short of his merits, was b. in London, Sept. 2, 1705, studied at Merton college, Oxford, and in 1726 became a member of the inner temple. Tucker, who was of good family, inherited a large fortune from his father; and in 1727 purchased Betchworth castle and estate, near Dorking, in Surrey. During his life he enjoyed all the ease, comfort, and quiet happiness of an English gentleman of the 18th century. It is but fair to state that his frank, generous, virtuous nature, and his sincere love of intellectual pursuits, prevented him from misusing the advantages of his position. In 1736 he married Dorothy, daughter of Edward Barker, esq.—afterward cursive baron of the exchequer, and receiver of the tenths—by whom he had three daughters, the youngest of whom, Dorothy Maria, became in 1763 the wife of sir Henry Paulet St. John, bart. Tucker's affectionate regard for his family is a beautiful feature in his character. He was, too, all his life, an industrious student, a man of keen observation, of much innocent and cheerful humor, and withal, of methodical business habits. His death occurred Nov. 20, 1774. Tucker's great work is entitled *The Light of Nature Pursued*. It was begun in 1756, and formed the chief literary occupation of the rest of his life. It extended to seven volumes, only three of which were published in the author's lifetime, under the pseudonym of Edward Search, esq. It is not a regular systematic treatise, but consists of a series of disquisitions on metaphysics, theology, morals, etc., all of which exhibit a remarkable originality, simplicity of humor, ingenuity of illustration, and solidity of understanding.

TUCKER, JOSIAH, D.D., 1711-99; b. Wales; graduate of St. John's college, Oxford, rector of St. Stephen's, Bristol; prebend, 1755; dean of Gloucester, 1758 till his death. He was a thorough student, and careful writer on political economy and subjects pertaining to religion, and published several pamphlets in the beginning of the contest between the English government and its American colonies in favor of the colonists.

TUCKER, NATHANIEL BEVERLEY, 1784-1851; b. Va.; educated at William and Mary college; studied law, and in 1815 began practice in Missouri. In 1834 he was appointed a professor in William and Mary college, and held the position until his death. He published treatises on *Pleading* and on *Constitutional Law*, and novels, of which *The Partisan Leader*, reprinted in 1861, has some historical interest, and has been thought to foreshadow dimly the war of secession.

TUCKER, SAINT GEORGE, LL.D., 1752-1828; b. Bermuda; educated at William and Mary college, and called to the bar. He took part in an expedition against Bermuda in 1777, and was dangerously wounded at Yorktown, where he commanded a regiment. He was afterward a member of the Virginia legislature, a professor at William and Mary college, and for many years a judge in Virginia. Among his publications were an edition of Blackstone's *Commentaries*; and *A Dissertation on Slavery* (1796).

TUCKER, SAMUEL, 1747-1833; b. Mass.; made capt. in the American navy in 1777. The next year he commanded the frigate *Boston*, which took over John Adams, recently appointed minister to France. After the capture of several prizes he took part in the defense of Charleston, S. C., at whose capture he was made prisoner in 1780. Exchanged the next year he commanded the *Thorn*, making many prizes. He afterward removed to Maine, and served in the legislature.

TUCKER, WILLIAM JEWETT, D.D., b. Griswold, Conn., 1839; graduated at Dartmouth coll. 1861, and at Andover theol. sem., 1866; was ordained, 1867, and assumed the charge of the Franklin St. (Cong.) church, Manchester, N. H., where he remained till 1875. He was pastor of Madison Square (Pres.) church, 1875-80; was elected Bartlet prof. of sacred rhetoric and pastoral theology, at Andover sem., 1880. He was one of the founders of the *Andover Review*.

TUCKERMAN, HENRY THEODORE; 1813-71, b. Boston; educated in the public school. Among his works are *The Italian Sketch Book* (1835); *Isabel; or Sicily, a Pilgrimage* (1839); *Rambles and Reveries* (1841); *Artist Life* (1847); *Characteristics of Literature* (1849); *The Optimist* (1850); *A Memorial of Horatio Greenough* (1853); *The Rebellion* (1861); *America and her Commentators* (1864); *The Criterion* (1866); *Maga: Papers about Paris* (1867); *Book of the Artists* (1868). He was also a frequent contributor to periodical literature. He lived in New York city after 1845.

TUCKERMAN, JOSEPH, D.D., 1778-1840; b. Boston; graduated at Harvard college, 1798; studied theology, and became a Unitarian pastor in Chelsea. He is best known as one of the founders of the first sailors' aid societies in the country, and from his connection with other benevolent societies here and in England. He wrote *Principles and Results of the Ministry at Large*, and other religious pamphlets.

TUCSON, city and co. seat of Pima co., Ariz.; on the Santa Cruz river, and the Southern Pacific railroad; 250 miles e. of Yuma. It is the seat of the university of Arizona, and has a high school, the institute of St. Joseph, public and university libraries, convent, hospital, national banks, daily and weekly newspapers, large co.

court-house, and numerous plants for the reduction of gold, silver, and copper ores. It is the center of a large mining, stock-raising, and general farming region, and is an important market for the precious metals, wool, hides, general commodities, and special supplies for the Indians and the U. S. army. Tucson occupies the site of an ancient Indian pueblo or town; was settled by Jesuit missionaries in 1560; and was the capital of Arizona territory in 1867-77. It is a quaint and interesting city, having narrow streets and many old adobe buildings, and at the U. S. signal station is 2404 feet above sea-level. Pop. '90, 5150.

TUCUM' AND TUCUMA' PALMS. See **ASTROCARYUM**.

TUCUMAN', a prov. in n. Argentine republic, having on the e. the Gran Chaco, on the n. Salta, on the w. Catamarca, on the s. Santiago; 13,500 sq. m.; pop. '95, 215,693. It contains gold, copper, silver, and lead. Sugar planting is the most important industry. Salt, from mines and lakes, cattle and mules are exported. Large crops of cereals are raised. It has some manufactures. Capital, Tucuman.

TUCUMAN', SAN MIGUEL DE, a t. of the Argentine republic, capital of the province of the same name, in lat. 26° 50' s.; is embosomed in splendid plantations of orange-trees. Tucuman has a cathedral, college, library, hospital, convents, a Jesuits' college, and many handsome houses. It carries on manufactures of sugar, leather and brandy, has an active trade in oxen and mules; and the females are noted throughout the confederation for their skill in making saddle-cloths. Pop. '96, 34,300. Here, in 1816, a congress of deputies from the various Argentine provinces met, and proclaimed their independence of Spain.

TUDELA (the *Tutela* of the Romans), a town of Spain, province of Navarra, on the left bank of the Ebro, which is here crossed by a bridge of 17 arches; 47 m. by railway n.w. of Saragossa. It is a dull, gloomy-looking place, with narrow streets and lofty houses; but the promenades along the river are very fine, as also are the *plazas*, or public squares. Tudela is the seat of a bishop, has a Gothic cathedral, a medical college, and manufactures of coarse woollen cloths, soap, earthenware, etc., and carries on an active trade in the products of the district. Pop. 8,900.

TUDOR, the surname of a family of Welsh extraction, which occupied the throne of England from 1485 to 1603. In the Welsh language Tudor is the equivalent of Theodore. Owen Tudor, the first of the race known in history, has had a pedigree assigned him from the ancient Welsh princes, which rests on no very solid evidence. In fact little is known of his origin, except that his father had to quit Wales on a charge of murder, and was outlawed. He seems himself to have been at one time a brewer at Beaumaris, in Anglesey; and he was afterward a retainer in the suite of the bishop of Bangor, and fought at Agincourt. His dancing at some court pageant is said to have first ingratiated him with Catharine of Valois, widow of Henry V., who appointed him to the office of clerk of the household, and before long entered either into an illicit connection or a private marriage with him. The indignation of the public at this step obliged the queen to take refuge in a convent at Bermondsey, where she died; and Tudor was sent to Newgate, but succeeded in escaping, and obtaining two audiences of the young king, Henry VI., who afforded him protection, and conferred on him the lieutenancy of Denbigh. Two sons had been born to him by the queen. On the elder, Edmond, the king bestowed the earldom of Richmond; and on the younger, Jasper, the earldom of Pembroke. The earl of Richmond married Margaret, daughter and heiress of John Beaufort, earl of Somerset, whose father was an illegitimate son of John of Gaunt by Katherine Swynford. The sole issue of Richmond and the heiress of Somerset, Henry, duke of Richmond, invited from abroad to deliver England from Richard III., ascended the throne after Richard's death at Bosworth as Henry VII. The partisans of the house of Lancaster supported him on the extinction of the lawful descendants of John of Gaunt; and by his marriage with Elizabeth, eldest daughter of Edward IV., and representative of the house of York, he was considered to have united the factions of the white and red rose. Five sovereigns of the house of Tudor successively occupied the throne—viz., Henry VII., Henry VIII., Edward VI., Mary, and Elizabeth—for an account of whom see separate articles. From Elizabeth, the last of the line, the crown passed to James VI. of Scotland, of the house of Stuart, in virtue of his descent from Margaret Tudor, daughter of Henry VII., and queen of the Scottish James IV. Strength of will was the prominent characteristic of the sovereigns of the house of Tudor; their rule, generally prosperous, was far more arbitrary and despotic than that of the Plantagenets. Parliament was in many cases but the exponent of the royal will, and taxes were frequently exacted, and penal statutes dispensed with, by the prerogative alone. The condition of England under the Tudors differed from despotic monarchies chiefly in the important respect that the sovereign had no standing army. The Tudor monarchs exercised a remarkable influence on ecclesiastical affairs; it was under their rule that the reformation took place, and the Anglican church was developed.

TUDOR, WILLIAM, 1750-1819; b. Boston, Mass.; graduated at Harvard, 1769; studied law with John Adams, and began practice in 1772. He became a col. and judge advocate general in the revolutionary army. After the war he was member of the legislature

and secretary of state in Massachusetts, was vice-president of the state division of the Cincinnati, and one of the founders of the Massachusetts Historical Society.

TUDOR, WILLIAM, 1779-1830 ; b. Boston ; graduated at Harvard in 1796. After a tour in Europe he founded the Anthology club, and contributed to its journal, the *Monthly Anthology*. In 1815 he founded the *North American Review*, writing most of the first four volumes. He was appointed consul at Lima in 1823, and *chargé d'affaires* in Brazil in 1827. He published *Letters on the Eastern States* (1820); *Life of James Otis* (1823), and other works. He was the originator of Bunker Hill monument.

TUDOR STYLE, in architecture, a rather indefinite term applied to the late perpendicular, and the transition from that to Elizabethan.

TUESDAY, the third day of the week, is so called from *Tuesday*, the day of Tiw or Tiu, the old Saxon name for the god of war. See **TYR**. The day bears a corresponding name in the other Germanic dialects.

TUFF, or **TUFA**, a rock formed from the ash or powder ejected from a volcano, mixed with the lapilli, or small fragments of lava. It may be arranged under the air, and remain quite loose, or be cemented by the percolation of water charged with mineral matter, by pressure or other cause. Sometimes the materials are arranged under water, and then the tuff contains organic remains, like other aqueous rocks.

TUFT-HUNTER. An undergraduate nobleman at Oxford has, until recently, been distinguished by a gold tuft or tassel worn on a black velvet cap. Hence the name *tuft-hunter* has been given in England to one who seeks the society of the nobility.

TUFTS, COTTON, 1734-1815 ; b. Medford, Mass. ; graduate of Harvard university, 1749 ; studied medicine and settled in Weymouth, Mass. He was one of the founders of the Massachusetts medical society ; its president, 1787-95 ; also one of the original members of the academy of arts and sciences. He made a vigorous appeal to the patriotism of his fellow-citizens in his instructions relative to the stamp act, 1765. He was representative to the general court, member of the governor's council, state senator, and delegate to the convention which ratified the U. S. constitution. He married a daughter of Col. John Quincy, aunt of the wife of President John Adams.

TUFTS COLLEGE, Medford, Mass., founded by the Universalists and first opened to students in 1855. Its endowment, a part of which is in real estate that for the present is unproductive, is estimated at \$1,800,000. It has an annual income of \$115,000. It has 14 excellent buildings, standing upon a tract of college land one hundred acres in extent. It has well appointed chemical, physical, and natural history laboratories, and an admirable cabinet of minerals, but as yet no considerable art collection. The library contains 35,000 vols. and 7000 pamphlets. The college has five departments—1. the college proper ; 2. department of engineering ; 3. the divinity school ; 4. medical school ; 5. Bromfield-Pearson school. The divinity school has five professors, one instructor, and four lecturers. The course of instruction does not differ essentially from that of other New England colleges of the first rank. Number of professors and instructors (1897), 85 ; of students, 500. Elmer H. Capen, D.D., president.

TUILERIES, PALACE AND GARDENS OF THE, were situated in the middle of Paris, on the right bank of the Seine, with Rue de Rivoli running along their n. side, and Quai des Tuileries to the south. Here, in 1342, a certain Pierre des Essarts possessed a pleasure house, called the *Hôtel des Tuileries*, on account of its being built in a locality outside the city where there were several tile-works (*tuileries*). Francis I. bought this property from the Sieur de Villeroy, as a present to his mother, the duchess of Angoulême. It was afterward chosen by Catharine de' Medici as the site of a new palace instead of that of Tournelles, and the building was begun in 1566. Originally, the palace consisted of only the square structure in the middle ; but was greatly enlarged by Henry IV., Louis XIII. and XIV., Napoleon I. ; and received still further improvements at the hands of the emperor, Napoleon III. Louis XIII. was the first sovereign who resided at the Tuileries. Louis XIV. only stayed there for a short time, and then established himself at St. Germain ; Louis XV. and XVI. lived at Versailles. In 1793 the national convention held its sittings in the Tuileries ; and Bonaparte chose it for his official residence. It was occupied by Louis Philippe, was the imperial residence of Napoleon III., and was burned by the commune in 1871. The side wings have been restored.

TUKE, DANIEL HACK, b. York, England, in 1827 ; visiting physician to the York retreat for the insane, subsequently medical practitioner at Falmouth. He has written many essays on the treatment of insanity for scientific periodicals. He wrote a *Prize Essay on the Progressive Changes which have taken place, since the time of Pinel, in the Moral Management of the Insane* (1854) ; *The Asylums of Holland, their Past and Present Condition* (1854) ; *On the Canon of the New Testament* (1860) ; *Insanity in Ancient and Modern Life* (1878) ; *A Dictionary of Psychological Medicine* (1892). He d. 1895.

TUKE, WILLIAM, 1732-1822, b. England ; a Quaker in religion, and noted for his benevolence. In 1792 he founded the York retreat for the insane, the first English asylum where patients were treated like unfortunates rather than as brutes. His *Biography* was published in 1856 by Dr. Daniel H. Tuke, his great-grandson.

TULA. See **TOULA**.

TULANE, PAUL, b. Princeton, N. J., in 1801; received a common school education; removed early in life to New Orleans, where he engaged in business and acquired great wealth. He retired from business, 1857, and returned to Princeton. In 1882 he gave to the city of New Orleans \$2,000,000 worth of real estate for the erection and endowment of a college for the education of the young white men of the city. He died at Princeton, 1887.

TULANE UNIVERSITY, an institution for higher education in New Orleans, La., formerly called the university of Louisiana. It has departments of law, arts and sciences, technology, and a university department of philosophy and sciences. With it is connected the H. Sophie Newcomb Memorial college for women. It is non-sectarian. In 1896 it had 952 students, 72 members in its faculties, and its president, in 1897, was William P. Johnston.

TULARE, a co. in central California, 5592 sq. m.; pop. '90, 24,574, chiefly of American birth, 524 colored. Co. seat, Visalia.

TULIP, *Tulipa*, a genus of plants of the natural order *liliaceæ*, having an inferior bell-shaped perianth, of six distinct segments, without nectaries; a sessile three-lobed stigma, a three-cornered capsule, and flat seeds. The bulb is fleshy, and covered with a brown skin. About thirty species are known, mostly natives of the warmer parts of Asia. The name tulip is supposed to be derived from the Persian name *thouleben*, which also signifies a turban. The most famous of all florists' flowers is the GARDEN tulip (*T. gesneriana*), which is from 18 in. to 3 ft. high, with a smooth stem, bearing one erect, large flower; the leaves ovate-lanceolate, glaucous, and smooth. The tulip is a native of the Levant; it was brought from Constantinople to Augsburg by Conrad Gesner, in 1559, and was rapidly diffused throughout all parts of Europe. The varieties in cultivation are innumerable. The tulip mania of the 17th c. in Holland is noticed in the article FLORISTS' FLOWERS. The tulip is still most sedulously cultivated in Holland, especially at Haarlem, from which bulbs are largely exported. It is prized merely for the size and beauty of its flowers; its smell being rather unpleasant. Great attention is paid to the cultivation of tulips, not only in the gardens of the wealthy, but often in those of the humbler inhabitants of small towns and villages, in which beautiful beds of tulips may often be seen. Tulips succeed best in a light, dry, and somewhat sandy soil. Bulbs are planted in the end of October, or beginning of November, and the flowers are produced early in summer. Beds of choice tulips are protected in spring by hoops and mats; and in the flowering season an awning of thin canvas is spread over them, which greatly prolongs the duration of their beauty, as they are soon spoiled by exposure to strong sunshine. Tulips are propagated by offset bulbs, and new varieties are raised from seed.—Another species of tulip, cultivated in gardens is the SWEET-SCENTED tulip, or VAN THOL tulip (*T. suaveolens*), which has a short, hairy stem, and yellow or red flowers, inferior to those of the common garden tulip in beauty, but prized for their fragrance, and for appearing more early in the season. It is often cultivated in pots in windows. It is a native of the s. of Europe. The WILD tulip (*T. sylvestris*), a native of many parts of Europe and Asia, is admitted into the British flora, but is a very doubtful native of Britain. It is common in the woods and vineyards of Germany and the s. of Europe. It has a slender stem, narrow lanceolate leaves, and a somewhat drooping, fragrant, yellow flower. It develops offset bulbs at the end of fibres thrown out from the root, at some distance from the parent plant. Its bulbs are eaten in Siberia, although bitterness and acidity characterize the bulbs of this genus.

TULIP MANIA. See FLORISTS' FLOWERS.

TULIP TREE, *Liriodendron tulipifera*, a beautiful tree of the natural order *magnoliaceæ*, a native of the United States of North America, having a stem sometimes 100 to 140 ft. high, and 3 ft. thick, with a grayish-brown cracked bark, and many gnarled and easily broken branches. The leaves are roundish, ovate, and three-lobed; the middle lobe obliquely truncated. The flowers are solitary at the extremities of the branchlets; they resemble tulips in size and appearance. The bark has a bitter, aromatic taste, and like that of all the *magnoliaceæ*, contains a bitter principle, called *liriodendrin*. It has been used as a substitute for Peruvian bark in intermittent fevers, and is a good tonic. The tulip tree is one of the most beautiful ornaments of pleasure-grounds, wherever it grows and flowers well, which, however, in Britain, it does only in the southern parts. It is now plentiful in many parts of the s. of Europe. In some parts of the basin of the Mississippi, it forms considerable tracts of the forests. The heart-wood is yellow, the sap-wood white. The timber is easily wrought, takes a good polish, and is much used for many purposes.

TULLAMORE, civic and market t., chief town of King's co., Ireland. It stands upon what may be called a fertile island of the great bog of Allen, and has within the last half c. risen into some importance. The pop. amounted in 1891 to 4522.

TULLE, a t. of France, dep. of Corrèze, at the embouchure of the Solane into the Corrèze. It is for the most part badly built, but has some fine promenades, excellent quays and bridges, a Gothic cathedral, an episcopal palace, a theological seminary, a communal college, an industrial college, a public library, and a theater. One of the

suburbs of Tulle, called Souillac, is a national military manufactory, and the town is otherwise notable for its manufactures of leather, paper, cards, lace (known as *point de Tulle*), liqueurs, and ironmongery. Some say that Tulle owed its origin to a Roman fort called *Tutela*; and in the vicinity are certain undoubted Roman remains; others, however, think it dates from the 4th century A.D. The pop. in '91, was 15,384.

TULLE, a kind of thin silk lace of a very open pattern and loose structure, usually in narrow widths, for dressing ladies' caps, etc.

TULLOCH, JOHN, D.D.; b. Scotland, 1823; educated at St. Andrews, and ordained at Dunbar in 1845 as a minister in the church of Scotland. He afterward studied theology in Germany; and in 1854 became principal of St. Mary's college in the university of St. Andrews. Among his works are: *Leaders of the Reformation* (1859); *English Puritanism and its Leaders*; *Rational Theology and Christian Philosophy in the Seventeenth Century* (1872); *Religion and Theology* (1875); *Movements in Religious Thought*. He d. 1886.

TULLY, WILLIAM, 1785-1859; b. Conn.; educated at Yale college; studied medicine; and in 1815 settled in Upper Middletown, now Cromwell, Conn. Meeting at that place Dr. Thomas Miner, he adopted his views on the treatment of spotted fever, and in 1823 published in association with him *Miner and Tully on Fever*. In 1824 he was chosen president of and professor of materia medica in the medical college at Castleton, Vt. He held the same chair in the Yale medical school, 1829-42.

TULTCHA, or **TULTSHA**, a t. in the Dobsudja, Roumania. It is built on the site of the ancient *Ægissus* on the right bank of the Danube; pop. about 12,000. It is 45 m. e.s.e. of Galatz, and has a good harbor, a citadel, and the ruins of a fortress damaged by the Russians, 1789-91. It was entirely destroyed in 1828; occupied by Russians, 1854. It has an important trade in salt fish, wool, and grain.

TUMBLER. See **LOCK**.

TUMBRIL, in an army, a covered cart on two wheels, for the carriage of ammunition, tools, etc., belonging to the artillery. The name obtained a melancholy celebrity from being applied to the carts which served to carry the unfortunate victims of the French revolution to the guillotine.

TUMORS do not admit of a simple definition, but, in the words of sir James Paget, who has specially investigated this department of surgical pathology, they all belong to the class of overgrowths or hypertrophies, and their most constant distinctive characters are: (1) that they are deviations both in respect to size and shape from the normal type of the body in which they are found; (2) that they have an apparently inherent power and method of growth; and (3) that their development and growth are independent of those of the rest of the body, continuing with no evident purpose when the rest of the body is only being maintained in its normal type.

Tumors are usually divided into two chief groups, known as innocent or benign, and malignant tumors. The characters of the latter are sufficiently discussed in the article **CANCER**, and we shall therefore restrict our remarks to innocent tumors. These may be divided into *cystic tumors*, or cysts, and *solid tumors*; while the latter are subdivided into the *discontinuous* and the *continuous*; the discontinuous being those which are completely invested with a layer of tissue, which at once isolates them and connects them with the surrounding parts, while the continuous ones appear as growths, not in, but of the surrounding parts, and appear as *outgrowths*, as, for example, many polypi, and pendulous or sessile tumors. In accordance with these ideas, sir J. Paget classifies innocent tumors as follows: I. **CYSTIC TUMORS: CYSTS**; which may be (A) *simple* or *barren* or (B) *compound* or *proliferous*. (A) *simple cystic tumors* include the varieties known as (a) *serous*, constituting what are termed *hydromata*, (b) *synovial*, (c) *mucous*, (d) *sanguineous*, (e) *oily*, (f) *colloid*, (g) *seminal*. (B) *Compound* or *proliferous tumors*, including (a) *complex cysts*, (b) *cysts with glandular* or other vascular growths, (c) *cutaneous cysts*, (d) *dentigerous cysts*. II. **SOLID TUMORS AND OUTGROWTHS**, including (a) *fatty* or *adipose*, (b) *fibro-cellular*, *areolar*, etc., (c) *fibrous*, *fibro-muscular*, (d) *cartilaginous*, (e) *myeloid* or *marrow-like*, (f) *osseous*, (g) *glandular*, and (h) *vascular*.

Of these various species we shall only notice a few of the most important. *Cutaneous cysts* may be congenital or acquired. They may be found under the skin of any part, but sir J. Paget regards them as probably a hundred times more common in the scalp than in any other part. Their rate of growth is uncertain. When they grow rapidly they are apt to ulcerate, and hence are derived most of the so-called "horns" of the scalp and face.

Cutaneous cysts are usually formed either by the morbid growth of natural ducts or follicles, or by the enormous growth of elementary structures, which increase from the form of cells and nuclei, and become closed sacs with organized walls capable of producing other growths. A hair follicle or a sebaceous gland of its duct become obstructed, is thus often the origin of a cyst. Cutaneous cysts may be treated in various ways. Those in which the skin over their chief prominence is marked with a small dark point, through which a fine probe may be passed into the cavity, may be gradu-

ally emptied by dilating their openings, and pressing out their contents; or they may be extirpated by caustic or the knife.

Fatty tumors are the most frequent of all innocent tumors, and are often described under the name of *lipoma* and *steatoma*. They do not differ materially in structure from the ordinary fat of the adjacent parts, and seldom cause much annoyance, except from their unseemly appearance. No good cause can be assigned for their formation, but they may sometimes be traced to a blow or friction, as of a strap. The age at which they most commonly show themselves is at about forty. They may occasionally be absorbed by the prolonged internal use of liquor potassæ; but this treatment is almost certain to disturb the general health, and, as a general rule, excision is the proper treatment. *Fibro-cellular tumors* are remarkable for the rapidity of their growth (three or four pounds in the year, and, in one case recorded by sir J. Paget, a pound a month), and the weight which they may attain (sometimes forty pounds or more). The most common seat of these tumors are the uterus, the scrotum, the bones, the subcutaneous tissue, the lobules of the ear, etc. Polypi of the uterus, nose, etc., belong to this class. Except in the case of polypi, excision is the only available remedy; and in some parts of the body this is of course impossible.

We will continue with a reference to a remarkable class of cases which often sadly puzzle the inexperienced surgeon. They are known as *phantom tumors*, and are apparently due to contraction of the muscles. "The abdominal muscles of hysterical women are most often thus affected; sometimes with intentional fraud. The imitation of a tumor may be so close as to require great tact for its detection, but chloroform, by relaxing the muscles, dissipates the swelling. Occasionally these apparent tumors move."—Paget on "Tumors," in Holmes's *System of Surgery*, vol. i., an article containing an excellent abstract of the most recent knowledge on the general subject of tumors.

The frequency of the occurrence of tumorous growths, the great variety of them, and their various relations to the constitutional condition of the subject in which they are developed, make them of great importance, not only to the surgeon, but to all who are liable to be afflicted with them, and a more or less general knowledge of them should constitute a part of the education of every intelligent person. According to Dr. John Hunter (1728-1793, q.v.), a tumor is a "circumscribed substance produced by disease, and different in its nature and consistence from the surrounding part," and this general definition by a master-mind, although not strictly correct in the light of modern pathology, is sufficient for our purpose. It may be well to add what has been proposed by one of the first of modern surgeons as an amendment, if for no other purpose than to show how little more can be added. "By a tumor may also be meant a more or less circumscribed mass, growing in some tissue or organ of the body, and dependent on a morbid excess of, or deviation from, the nutrition of the part." Tumors may be considered under two heads, viz., local hypertrophies, or outgrowths of the normal structure of the part, and of new formations presenting structural characters differing more or less from those of the parts around. The tumor thus formed grows by an inherent force of its own, without regard to the growth of the rest of the system, obeying, however, the general laws of growth which govern the organism in which they are developed.

A classification of tumors may be made from their anatomical structure, or from their vital and clinical characters. As stated in preceding paragraphs, surgeons have for a long time divided tumors into *malignant* and *non-malignant*, but this division is not scientifically exact. Some tumors, as cancers, are always essentially malignant, and others are always benign, as certain cysts; but there are many that are usually benign or non-malignant, which, however, from causes yet unknown may take on malignant characters. Such are termed semi-malignant. Non-malignant tumors are local in their development, and are often described as having no hereditary connection. This, however, is frequently not so, as it is well known that cystic tumors, particularly of the scalp, are known by common observation to be often hereditary. But notwithstanding they may be hereditary they are properly considered as local, because the constitution of the individual does not appear to be affected any more than where other peculiarities, such as double fingers and moles, are inherited.

From these growths malignant tumors have a wide difference. They are usually characterized by great luxuriance of development of a rather low character, a luxuriance termed vegetative, and are very liable to undergo, especially in their central parts, degeneration, ulceration, and gangrene. They represent a very great departure from the normal nutrition of the part, and as a rule indicate a fault, although it may be but little manifested outwardly, in the general nutrition of the body. Malignant tumors are often called heteromorphous, and this is true to a certain extent, but not so far as to signify that the new product is formed entirely on a new type, for the doctrine of Virchow, that "the same types of anatomical structures exist in new formations as are found in the body generally" is not disputed by the majority of pathologists. Briefly stated, the following are the principal signs in malignant tumors: It is at first small and usually with a distinct outline. There is a constant tendency to extension by local infiltration into the adjoining parts, by absorption, by incorporation into their substance,

and by deposit of the new elements in their place, and this process is continuous; often very slowly, as in hard cancer of the breast, but in many cases, in certain situations, rapidly, as in soft cancer, the rapidity being usually the measure of the malignancy. The extent of the growth is unlimited, that is to say, it may attain any size consistent with the life of the subject; but when a certain extent is reached, depending on the constitution of the patient, the central parts undergo fatty degeneration, and when this degeneration reaches the surface there is rapid sloughing or ulceration toward the center, causing profuse discharges which are usually very offensive, and often accompanied by hemorrhage. After a time, which varies considerably, the lymphatic glands which lie in the course of the lymphatic circulation, become enlarged and hardened in consequence either of a deposit of morbid elements, or from congestion of the glandular structure produced by a morbid condition of the fluids which pass through them. This affection of the glandular system constitutes what is called the secondary form of the disease, in contradistinction to the primary tumor. This lymphatic complication may occur before the skin is affected, but almost invariably soon after that occurrence, and the pathological condition of the glands as revealed by the microscope are the same as that of the primary tumor. After the lymphatics are affected the internal organs, particularly the lungs and the liver, become the seat of secondary deposits, which, however, may differ somewhat in character from the primary tumor, and these deposits then become the foci of further development of the elements of the disease, which have an increased rapidity of growth; in other words, an increased malignancy. After the lymphatic glands are affected constitutional symptoms appear, such as sallowness, disturbance of digestion, wasting of the body, and general anæmia. Most malignant tumors are cancerous, but not always, although cancers are always malignant. Other malignant tumors are sarcomas.

Tumors may be divided into five classes. 1. *Cystic tumors*, which may be again divided according to their contents into what are called (a) dermoid cysts, having their commencement in the derma, or skin, including three varieties; those containing epidermis; those containing true skin, hair, and glands; those containing cartilage, bone, and teeth. See *Cutaneous cysts* in TUMORS. (b) Serous cysts, occasioned by dilatation of sacs, cavities, or canals, including blood-vessels, most frequently situated about the neck, but met with in almost every situation. They are lined with flat endothelium (epithelium), like that lining serous cavities generally. See SEROUS MEMBRANES. A variety of serous cysts called multilocular (many-celled) are frequently met with in the ovaries, and constitute one form of ovarian dropsy or tumor. The ovarian cyst may also be unilocular (one-celled). Sanguineous cysts (hematoma) are a peculiar variety which have been well described by sir James Paget as chiefly occurring about the neck, parotid gland, and anterior part of the thigh, leg, and shoulder. They contain fluid blood more or less altered. They may be formed in three ways: by hemorrhage into a previous serous cyst; by transformation of nævus (q.v.); or by occlusion of a vein. (A peculiar form of hematoma of the ear is often met with in the insane). The term hematoma is also applied to those cysts which result from changes taking place in extravasated blood, as in the brain. Other serous cysts are formed by accumulation of fluid in the meshes of the areolar tissue, and by changes in the products of inflammation. (c) Colloid cysts, arising from colloid (gluey) degeneration of pre-existing cells, and from colloid degeneration of new cells. Other cysts are formed by the development of parasites, the most common of which is the hydatid cyst arising from the presence of the young of *tænia echinococcus*. 2. *Tumors composed of one of the modifications of fully developed connective tissue*, such as fatty tumors (lipoma,) fibrous or fibroid tumors, and fibro-cellular tumors (fibroma), cartilaginous tumors (chondroma, see ENCHONDROMA), bony tumors (osteoma, exostosis). The causes of *exostosis* are obscure. In some instances they are hereditary. The disease is usually met with at about the age of puberty. There are two modes of development; primarily as true bone, and secondarily from previously formed cartilage. Exostosis may be simple or multiple, and are of two kinds, hard, or *ivory exostosis* and *spongy, or cancellous exostosis*. Another variety of these tumors of the second class is *myxoma* or mucous tumor. This has been classed by some writers as a variety of sarcoma. Many tumors formerly described as colloid cancer belong to this class. These tumors usually appear in the form of round, oval, or lobular masses surrounded by a loose capsule of connective tissue. They are elastic and gelatinous, and of slow growth. When cut they present generally a delicate pink color, but are sometimes yellow, and pour out an abundance of a glairy, tenacious fluid resembling gum water. A microscopic examination shows a beautiful arrangement of branched cells and net-work. Virchow regards these tumors as closely related to embryonic fat. 3. *Tumors which resemble in structure more or less perfectly one of the more complex tissues of the body*. One variety of these is myoma, or muscular tumor. There are two classes, one containing striated, and the other non-striated, muscular fiber. Belonging to this class are *neuromas*, or nervous tumors, rare growths when strictly growing out of nervous tissue. They are always non-malignant, and should never be interfered with except when giving pain. *Angiomas* are tumors composed of vascular tissue of new growth; one variety is *nævus* (q.v.) Other tumors of this class are *lymphangioma*, a tumor composed of lymphatic vessels; *lymphadenoma*, one composed of tissue like that in the lymphatic glands, and *papilloma*,

a tumor resembling the papillæ of the skin or mucous membrane, and including such growths as corns and warts (q. v.). 4. *Tumors composed of tissue which is either purely embryonic, or as showing some signs of a tendency to develop into adult tissue of the connective type.* These tumors comprise the *sarcomas*, or sarcomata, growths which have been the subject of much controversy, but whose classification is now pretty well settled. Many until recently were known under a variety of names, and grouped in other divisions. Formerly the term sarcoma was applied to almost any soft fleshy growth. The soft sarcomata of bones and of secreting glands and lymphatics were formerly called soft cancer, and melanotic sarcomata were called melanotic cancer. Hard, firm sarcomata were often described as hard cancer or scirrhus. The tumors described by sir James Paget as fibro-plastic, fibro-nuclear, recurrent-fibroid, etc., have all been brought into the great class *sarcoma*. These tumors may grow in any part of the body, and present every variety of consistence, color, and form; they may be circumscribed or diffuse, and as benign, as a fatty tumor, or as malignant, as the worst form of cancer. The anatomical type of sarcoma is found in the embryonic tissue. See DEVELOPMENT OF THE EMBRYO. Its pathological type is seen in the cellular products of inflammation, with the particular difference that inflammatory new growths tend to limit themselves, whereas sarcomata have a tendency to indefinite growth, and the individual elements (cells) are often much larger, and have less tendency to form tissue. It is chiefly according to the size and form of the cells that sarcomas are divided into varieties. We have space here to scarcely more than mention the names of these varieties. *Small round-celled sarcoma*, or granulation sarcoma (formerly called encephaloid cancers), and resembling superficial layers of granulations in healing wounds, being composed of small round cells about the size of white blood-corpuscles. *Spindle-celled sarcoma*, formerly called recurrent-fibroid tumor, and fibro-plastic tumor, a growth composed of spindle-shaped, fusiform cells, either lying in contact or separated by a homogeneous or fibrous intercellular substance, the cells varying greatly in length, from $\frac{1}{1000}$ to more than $\frac{1}{100}$ of an inch. *Oval-celled sarcoma* is a variety of spindle-celled, of very rapid growth and great malignancy. *Myeloid, or giant-celled sarcoma*, formerly classed as fibro-plastic, and sometimes as soft cancer, and by Abernethy called *albuminous sarcoma*, whose peculiar characteristic is the presence of large, many-nucleated masses of protoplasm, resembling the cells found in the marrow of fetal bones. The cells are sometimes $\frac{1}{100}$ to $\frac{1}{50}$ of an inch in diameter, and of irregular shape, the nuclei varying from ten to forty in number, of oval shape, and having highly refracting nucleoli. These myeloid cells are imbedded in masses of spindle-shaped or roundish cells. These tumors are extremely vascular. *Ossifying and osteoid sarcomata*, formerly called bone, or osteoid cancer. Almost any form of sarcoma may undergo ossification, the varieties already mentioned often showing abundant formation of bone. *Alveolar, or large round-celled sarcoma*, occurring chiefly in the skin, bones, and muscles, and difficult of distinction from hard cancer. *Melanotic sarcomata*, or *melanosis*, formerly regarded as *melanotic cancer*, was carefully studied by Carswell, and arranged under the heads *punctiform melanosis*, *tuberiform melanosis*, and *stratiform melanosis*. These growths are usually of the spindle-celled variety, but contain large numbers of round or oval, and fusiform cells. The spindle-cells are large, and there is no fibrous material. The pigment consists of a brown granular matter in the interior of many of the cells, while the remainder are colorless. They are usually developed in those situations where pigment naturally exists, as in the skin, and the choroid coat of the eye-ball, but sometimes are found in the lymphatic glands. They are of rapid growth, and usually occur in middle life. They are among the most malignant of tumors, and the secondary deposits occur in every part of the body, being distributed either by the vascular system alone, or by both blood-vessels and lymphatics. If a melanotic sarcoma has reached the size of a filbert it may be concluded that secondary deposits have already taken place, and that the disease has reached a rapidly fatal stage. Of other forms of sarcoma there is no space for mention. This brings us to the consideration of the last class of tumors. 5. *Tumors composed of cells of an epithelial type arranged in spaces in a stroma consisting of more or less perfectly developed fibrous tissue.* This group constitutes the *cancers* or *carcinomas*. See CANCER.

TUMULUS. See SEPULCHRAL MOUND.

TUN, a word which, under various modifications, exists in the Celtic and Teutonic languages, seems connected with the Latin *teneo*, I hold, or the Greek *teino*, I stretch, and signifies primarily a large vessel or cask. In various countries, Britain included, it denotes also a liquid measure of capacity; in old ale and beer measure, the tun was equal to 216 gallons (each gallon = 282 cubic in.), in old wine measure it was equal to 252 gallons (each gallon = 231 cubic inches). The tun and all other liquid measures of higher denomination than the gallon are no longer legal; but the names are, for convenience, still retained. These denominations had their origin in the natural practice of giving names to casks in common use which preserved a uniform size. As a tun of water weighs a little more than 2,000 lbs., it is probable that the ton weight (see Ton) was taken from the tun measure.

TUNBRIDGE, a market town in Kent, England, stands on the Medway, on ground rising from the banks of that river, 27 m. s.e. of London. The castle, which stands on the Medway, near the entrance of the town, dates from the close of the 13th c., has a noble gate-tower of great size, richly ornamented, and is at present occupied as a military training school. The parish church is a large and old, but sadly disfigured building; but the chief establishment of the town is the grammar school, founded in 1553, with an endowment of £5500 a year. The manufacture of toys and turned and inlaid articles of wood (see next article) is a specialty. Pop. '91, 10,123.

TUNBRIDGE-WARE, a kind of wood manufacture carried on at Tunbridge and Tunbridge Wells. It consists of such articles as ladies' work-boxes, ring-boxes, desks, etc., which are covered with a veneer characteristic of this industry, and formed from small pieces of wood of square and triangular shape in transverse sections, built up in geometric patterns; these are carefully glued together so as to form a solid mass, from which thin transverse veneers are cut, and are used to cover the articles made. This trade was formerly of much greater importance than at present.

TUNBRIDGE WELLS, a famous English inland watering-place, and after Bath, the oldest in the country, stands on the s. border of Kent, 5 m. s. of Tunbridge. The town which is rapidly extending, occupies the head and slopes of one of the valleys of the Weald, and has in general a s.w. aspect, commanding very fine views. The three centers of population are mounts Ephraim, Sion, and Pleasant, separated by a large common and cricket ground. The waters are chalybeate. The wells, discovered in 1606 by lord North, are situated at the end of a promenade called the *pantiles*. In the vicinity are charming rides and walks. Tunbridge ware is also largely manufactured here. Pop. '91, 27,895.

TUN OF HEIDELBERG, THE, is a huge reservoir for the storage of wine, built in the castle of Heidelberg, Germany. The first tun was built about 1589 and held over 500 hogsheads. The present tun was finished in 1751. It is built of thick copper plates, strongly bound with iron hoops, measures thirty six feet by twenty four feet, and is as high as an ordinary two-story cottage. Its capacity is 49,000 gallons or about 800 hogsheads. For many years it was filled annually, and the close of the vintage was celebrated with rustic dances that were held on a platform on the top of the tun. It is now about half a century since it was filled the last time. Notwithstanding its immense size, it has been exceeded by some of the beer-vats in use by the London brewers, one of which is described as holding 108,000 gallons. Allusion to the tun of Heidelberg is found in the travels of Bayard Taylor and of Irving.

TUNDRA (in Finnish, *tuntur*—that is, mossy flat) is the Russian name for the vast plains which border on the Arctic ocean in Siberia, and also westward from the Ural along the n. of Europe. They are swampy tracts of land, partly covered over with a thick felt of bog-moss, and partly with a dry snow-white covering of reindeer-moss and different kinds of lichens. It is only the reindeer that renders this frightful waste habitable for the wandering hordes of Samoyedes, who hunt the furred animals as well as the swans and wild geese which in summer flock hither in vast numbers. These polar steppes, however, can be trodden only in winter, when the whole region is one sheet of frozen soil and ice. In summer, when the surface thaws, the greater part of the region becomes an inaccessible morass, except a portion along the n. coast of Siberia, which retains its snow covering throughout the year.—See Schrenk, *Reise nach dem Nordosten des Europ. Russland durch die Tundren der Samoyeden* 1837 (Dorpat, 1848).

TUNE, a short popular melody; also, that property of musical sounds by which they stand to each other in the relation of pitch (q. v.).

TUNGSTEN (symb. W, equiv. 92—in new system, 184—sp. gr. 17.6) is a rare metal, which derives its name from the Swedish words *tung*, heavy, and *sten*, a stone. It is chiefly derived from wolfram (whence the symbol W), which is a tungstate of iron and manganese, and likewise occurs in schleelite, which is tungstate of lime. It is unnecessary to describe the means of separating the metal, which may be finally obtained either as a dark-gray powder or in heavy iron-gray bars, which are very hard, and difficult of fusion. Aqua regia and nitric acid convert it into tungstic acid. When 10 parts of this metal are alloyed with 90 of steel, a mass of extraordinary hardness is obtained.

Tungsten forms two compounds with oxygen, viz., a binoxide (WO_2), which is obtained in the form of a brown powder, by heating tungstic acid to low redness in a current of hydrogen, and which does not form salts with acids; and an acid teroxide, known as *tungstic acid* (WO_3). Independently of *tungstic anhydride*, there are two modifications of this acid, represented by the formulæ $HO.WO_3$, and $HO.W_2O_6$, which are known as *tungstic* and *metatungstic acids* respectively. Various tungstates have been formed and examined. Of these, the most singular is tungstate of tungsten ($WO_2.WO_3$), which is of a splendid blue color; and tungstate of soda, which answers admirably as a means of preventing muslin, etc., from bursting out in a flame when brought in contact with fire. It is unnecessary to notice the metatungstates, or the sulphides, chlorides, etc., of tungsten.

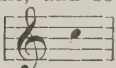
TUNGURAGUA, a province of the republic of Ecuador, with an area of about 1686 sq. m., and a population estimated, in 1890, at 103,033. The province contains the famous volcano of Tunguragua, nearly 16,700 ft. high, and on its western limits lie the volcanoes Chimborazo and Caribuhairazo. The capital is Ambato, with an estimated population of 12,000.

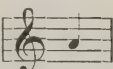
TUNGÛS, an ethnographic group of the Turanian family, are at the present time situated to the n. and e. of the Mongol group, inhabiting the vast plains stretching s. from the icy sea of Siberia, between the Yenesei and the Lena, the northern slopes and valleys of the Great Altaï, and the hilly uneven tract between the upper Ameer and the Lena. The chief peoples included under this group are the Niuju, the Däurians, Tshapodshirs, Manchûs (in the s.e.), and Lamûts (on the e. coast). In the n. they have intermingled with the Samoyedes; in the w. with the Ostiaks, whose territory is on the other side of the Yenesei; and in the s., the Manchûs, though being gradually pushed northward by the Chinese, have for a long time exercised undisputed sway over their supplanters. Divided politically between Russia and China, the southern portion of them are Buddhists, while the tribes further n. mostly practice Shamanism (q.v.), a few having, by the strenuous exertions of the Russian government, been induced to profess Christianity. The Tungûs are partly nomad and wandering, and partly agriculturists and settled rearsers of cattle. The first of these are commonly classed according to the districts they prefer to dwell in, as Tungûs of the forests, or Tungûs of the steppes; the former being shepherds, hunters, or fishers; and the latter exclusively shepherds. The steppe Tungûs, again, are divided according to the animals of draught they employ, into the reindeer-Tungûs, the horse-Tungûs, and the dog-Tungûs. The Tungûs are in general robust and lively, with flat visage and small eyes, the latter characteristics, however, being much less prominent in them than in the Kalmucks. A portion of the Chinese Tungûs constitute the Solon nation so celebrated as warriors in Chinese modern history. The Tshapodshirs tattoo their faces. See illus., ASIA, vol. I.

TUNICA, a co. in n.w. Mississippi, having the Mississippi river for its w. boundary; 450 sq.m.; pop. '90, 12,158. Co. seat, Tunica.

TUNICATA, a class of acephalous mollusks, having the body inclosed not in a shell, but a soft elastic tunic, which is perforated by two apertures, and is composed of a substance resembling cellulose (q.v.). The tunicata are extremely numerous, and are found in all seas. The *ascidiæ* (q.v.) belong to this class, and the *salpidae* (see SALPA).

TUNING-FORK, a contrivance for regulating the pitch of the voice or of a musical instrument. It consists of two prongs of steel springing from a handle, and so

adjusted as to produce a fixed note when struck. It is usually tuned in C 

in Britain, and in A  in Germany. In consequence of the absence of any

universally recognized standard, there is even in this country a considerable variety in the pitch of the tuning-fork. Messrs. Broadwood employ three forks of different pitch to tune their piano-fortes: one corresponding to the philharmonic standard of 30 years back for instruments used for the accompaniments at ordinary concerts; another somewhat higher for piano-fortes meant to take part in orchestral compositions; and a fork of still higher pitch, adopted for the present opera and philharmonic standard, which is about a semitone higher than the standard of 30 years ago. A fork has lately been invented in Germany capable of adjustment to different standards of pitch, by means of a moveable brass slider, fitted with a screw, there being indications on the prongs of the positions of the slider which give the pitch adopted by the principal orchestras in Europe. See illus., SOUND, vol. XIII.

TUNIS, a French protectorate in northern Africa, is bounded on the n. by the Mediterranean, on the w. by Algeria, on the s. by the Sahara, and on the e. by Tripoli and the Mediterranean. Its greatest length from n. to s. is about 440 m.; its average breadth, 160 m.; area, about 45,000 sq. m.; pop. estimated in 1881 to be 1,500,000. Tunis is traversed by branches of the great and little Atlas range, with an average height to 4000—5000 ft. The northern coast is rocky and steep, with numerous bays, of which the largest is the gulf of Tunis; and two of its promontories, capes Blanco (*Râs-el-Abid*) and Bon, are the most northern in Africa. The eastern coast, on the other hand, is flat, sandy, and infertile, like that of Tripoli, but has two large gulfs, Hammamet and Cables (the *Syrtis minor* of antiquity). The southern part of Tunis belongs to the desert steppe known as Belud-el-Jerid. There is only one fresh-water lake of any consequence, that of Biserta or Bensart, near the n. coast. The brooks and torrents of Tunis either lose themselves in the sand, or find their way to the sea after a short course. None are navigable. The longest is the Mejdah (the *Bagradas* of the ancients), which flows in a generally north-eastern direction into the gulf of Tunis. Other streams are the Ved-el-Milianah and the Ved-el-Kebîr. There are several mineral springs in the country. The climate of Tunis is fine, and the soil exceedingly fertile, so that, in spite of a very poor knowledge of agriculture, wheat, barley, maize, dhurra, pulse, olives, oranges, figs, grapes, pomegranates, almonds, and dates are abundantly produced. The culture of oil is more attended to, and is very lucrative. Great herds

of cattle are fed on the plains; the sheep are famous for their wool; and the horses and dromedaries are no less celebrated. The chief mineral products are sea-salt, saltpeter, lead-ore, and quicksilver. In the vicinity of the sea-coasts, considerable manufacturing and trading industry is manifested, more particularly in the cities of Tunis and Susa. Wool, cottons, cereals, cattle, wines, fruits, sugar, machinery, olive oil, hides, wheat, and barley are the principal exports. Cloth, leather, silks, muslin, spices, cochineal, and arms are transported by caravans to the interior of Africa, whence are brought for export to Europe, etc., senna, gums, ostrich feathers, gold, and ivory. In 1895 the imports amounted to 44,085,945 francs, and the exports to 47,525,784 francs. The total revenue, 1896, was estimated at 22,849,000 francs, and the expenditure at 22,848,000 francs. In 1895 there were 880 m. of railroads, and 1525 m. of telegraph line.

The predominant race is of Arabic descent, but there are many Berbers, especially in the interior. The French population in 1891 was 9973. The territory of Tunis corresponds pretty nearly with that of ancient Carthage; and for a sketch of its pre-Christian history the reader is referred to the articles CARTHAGE, ROME, HANNIBAL, HAMILCAR, SCIPIO, JUGURTHA, etc. Its subsequent fortunes, down to 1575 are interwoven with the general fortunes of Barbary (q.v.); but in that year Sinan Pasha conquered and incorporated it with the Ottoman empire, and gave it a new constitution. The government was placed in the hands of a Turkish pasha, a divan or council, composed of the officers of the Turkish garrison, and the commander of the janizaries. After a few years, however, an insurrection of the soldiery broke out, and a new government was established, the head of which was a "dey," possessing very limited authority; the chief power being at first exercised by the military divan. Gradually, however, an officer with the title of "bey," whose original functions were confined to the collection of tribute and taxes, acquired a supremacy over the other authorities, and finally obtained a kind of sovereignty, which Murad bey succeeded in making hereditary. The family of Murad Bey ruled in Tunis for 100 years, and gained considerable renown both by their conquests on the mainland, and their piratical enterprises against Christian powers at sea. During the 18th c., it became tributary to Algiers. About the beginning of the 19th c. Hamuda Pasha threw off the Algerian yoke, subdued the Turkish militia, and created a native Tunisian army; in consequence of which Tunis virtually attained independence. The recent rulers, Achmet Bey (1837), Mohammed Bey (1855), and Mohammed Sadyk Bey (1859), were very liberal, enlightened, and reforming sovereigns. By a firman of Oct. 25, 1871, the sultan renounced the tribute formerly exacted, and fixed the future relations of the sublime porte to Tunis. The "bey" was to receive his investiture from Constantinople; without the sultan's authority he could neither declare war, conclude peace, nor cede territory; the sultan's name must appear on all the coinage, the army must be at the disposal of the porte. In internal matters, however, the power of the bey was to be absolute.

In the spring of the year 1881 the government of France resolved to put an end to the repeated invasion of Algerian territory by plundering bands from Tunis. It was asserted by the French press that the invasion of French rights was not discouraged by the Italian consul, Signor Matteo. The invading troops approached and surrounded the capital, and May 12, 1881, the bey was induced to sign a treaty, in ten articles, of which the main provisions are said to be, that there shall be a French minister resident in the capital to guard French interests; that several positions on the coast shall be occupied by the French, including, it is reported, Susa, Goletta, and Benmenter; and that France shall in certain matters regulate Tunisian finances. This treaty has caused some indignation among the other powers, especially Italy and the Porte, the latter claiming a suzerainty over Tunis which is not practically evidenced.

TUNIS, capital of the African state of the same name, lies on the west side of a small lake or lagoon, near the s. w. extremity of the lake of Tunis, about 3 m. from the ruins of ancient Carthage. It occupies rising ground, and both the city proper and the suburbs are surrounded by walls. The streets are narrow, unpaved, and dirty, but the bazars are well furnished, and many of the mosques are really splendid, particularly the mosque of Jussuf, which has beautiful marble pillars. The palace of the bey is probably the finest building in Tunis; the ceilings glitter with gold and carmine and azure. All the principal rooms open into a large court-yard paved with marble, and surrounded by arcades supported on marble columns, while fountains everywhere diffuse a perpetual and delicious coolness. The citadel, begun by Charles V., and finished by Don John of Austria, is interesting from its collection of old arms, and was formerly the great slave-prison of Tunis. There are also Roman Catholic and Greek churches, Jews' synagogues, an Italian theater, and large barracks in Tunis. Tunis is the commercial center of the state. A canal was opened in 1893 by means of which ocean-going vessels can reach Tunis directly. Tunis has silk and woolen manufactures, as shawls, tapestries, mantles, bur-nooses, caps, turbans, colored cloths, also leather, soap, wax, and olive oil, all of which it exports, together with grain, fruits, cattle, fish, ivory, gold dust, coral, etc. Pop. stated at 153,000.

The lagoon or lake of Tunis is shallow, and communicates with the *Gulf of Tunis*, an inlet of the Mediterranean, by a narrow strait called the Goletta. The Gulf itself is 45 m. broad at the entrance—between cape Bon and cape Farina—and extends inland for 30 miles. The anchorage is good.

TUNKERS, a religious sect, occupying settlements in New England, New York, Pennsylvania, Ohio, Indiana, etc., and thus pretty widely scattered throughout the

northern and middle parts of the United States. They are nowhere numerous, and are chiefly occupied in the cultivation of the soil. The name which they take for themselves is simply that of brethren, and they profess that their association is founded on the principle of brotherly love. The name Tunkers is of German origin, signifying Dippers, and is due to their dipping in baptism. It is very commonly, by corruption, pronounced and written *Dunkers* and *Dunkards*. In the vicinity of their settlements they are generally known as the *Harmless people*. They derive their origin from a small village on the Eder in Germany, but have been an exclusively American sect since the beginning of last century, when they all emigrated to America. Religious statistics for 1894-5 gave the number of ministers of all "Dunkard" bodies in the United States as 1016 and the membership as 76,644. They reject infant baptism, and have no ministers specially devoted to the ministry as a profession. Every brother is allowed to stand up in the congregation and exhort; and when one is found particularly apt to teach, he is ordained by laying on of hands with fasting and prayer, and is expected to devote himself in some measure to the ministry, although without any stipend or pecuniary reward, even if his own crops should suffer by his neglect of them. There are deaconesses as well as deacons among the Tunkers. Like the Quakers, they use great plainness of dress and language; they refuse to take oaths or to fight; and they will not go to law. They celebrate the Lord's supper, and accompany it with love-feasts, washing of feet, the giving of the right hand of fellowship, and the kiss of charity. They anoint the sick with oil in order to their recovery, depending upon this unction and prayer, and rejecting the use of medicine. They generally believe in the doctrine of universal salvation; but it is not a tenet of the sect. They do not insist upon celibacy as an absolute rule; but they commend it as a virtue, and discourage marriage. They are industrious and honest, and universally held in good repute among their neighbors.

Sole dependence upon prayer for the cure of the sick is the characteristic also of a small religious sect, of which a few members are to be found in England, calling themselves the *Peculiar people*. In Switzerland the name of Dorothea Trudel (d. 1862) was long famous for the cure of ailments by prayer. She did not, however, in all cases, refuse to call in medical advice. In Germany a Protestant pastor, Blumhardt, pursues a similar system on a large scale, and it is said with great success. See BAPTISTS, GERMAN.

TUNNEL. Tunnels are passages constructed under ground to carry roads, railways, canals, or streams of water. Tunneling, which has long been in use for roads, and aqueducts, has of late received a great development in the construction of railways. At the present time there are believed to be upward of 80 m. of railway tunnels in Great Britain in constant use for the passage of trains; and, as their cost averages from £45 to £50 per yard, a total of about seven millions sterling has been expended in their construction. In tunnels of considerable length, as the progress made by working from the two ends would be very slow, it is considered advisable to commence the work from many points of its length; for this purpose, shafts or pits are made at these points down to the level of the tunnel. Of these shafts, some are temporary, and only kept open during the progress of the work; others are permanent, and for the purpose of ventilating the tunnel when in use. These shafts have to be large enough to allow the ascending and descending skips or buckets containing the excavated materials to pass one another. For the temporary shafts, an elliptical shape is found to give the greatest room for this purpose at the least expense. Square shafts are to be avoided, on account of the difficulty of excavating the corners in rocky strata. As the shaft descends, its sides are lined with timber-planks, supported by strong timber-frames, about 5 ft. apart. The permanent shafts, when the material is not of rock sufficiently solid, are lined with brick-work or masonry, built in lengths, as the shaft proceeds downward. These permanent shafts are generally made circular in section, and it is found better to place them 3 or 4 yards from the side of the tunnel, communicating with it by a small passage. This is convenient in the construction, and also is a useful refuge for workmen subsequently during the passage of trains. These shafts are generally made about 10 ft. diameter. They are sunk a few feet below the floor of the tunnel, to form a pit for the collection of the water from the workings, which is hauled to the top in barrels or buckets. The raising of the excavations and the water, and the lowering of building materials, and of the workmen, is done by a windlass, a horse-gin, or steam-power, according to the extent of the work. On the completion of the shaft, the tunnel is commenced in both directions from its bottom; and in the case of ordinary rock, it is found convenient to commence by making a small adit, or passage, along from shaft to shaft, through the whole length of the tunnel; this is made six or seven ft. high, and the top of it placed at the level of the top of the tunnel. When this is completed, the correct center line is marked out in it throughout the tunnel; the adit is then enlarged to the shape and size of the arch of the tunnel, which is built in, and then the excavation is completed, and side-walls built up to underpin the arch. In cases where the material is soft and full of water, the full section of the tunnel is generally carried forward at once, and in such cases an invert has to be built between the side-walls, to withstand the upward pressure, as the pressure of soft material has the character of a fluid pressure, and presses the tunnel on all sides. The excavation is then done in lengths of about 24 ft., which is firmly secured with poling-boards and larch bars, and securely shored; the centers are

then set, and the brick-work built up. The timber bars are generally drawn out when the brick-work is carried up, and the holes they leave rammed tight with clay; but they have sometimes to be built in. When the quantity of water is very great, an adit is driven through the tunnel, at the level of its floor, before the work is begun, to allow the water to run off.

Tunnels are generally made straight, but sometimes they are curved; this is done that they may pass under the lowest part of the hill, in order that the shafts may be as short as possible. They are frequently constructed on steep gradients, but as the trains experience some resistance from the air in passing through them, it is advisable not to make them so steep as the gradients in the open air.

Before the St. Gothard tunnel was built, the most remarkable was the Mont Cenis,* which connects the railways of France and Italy, and is on the direct railway route from Paris to Turin. The length of this tunnel is 7 m. 4½ furlongs. It is 434 ft. higher at Bardonnèche, on the Italian side, than at Modane, on the French side. On this account, it is on a gradient of 1 in 45½ from Modane to the middle, and thence it falls 1 in 2,000 to Bardonnèche, this latter fall being sufficient to run off the water. The dimensions at Modane are 25 ft. 3½ in. wide at base, 26 ft. 2½ in. at widest part, and 24 ft. 7 in. high, the arch being nearly semi-circular. At Bardonnèche it is 11½ in. higher. The work was begun in 1857, and was at first done in the usual way by hand; but in 1861 the perforating machines described below were introduced on the Italian side, and two years later (1863) on the French side. On June 30, 1863, the tunnel had been driven 2,800 yds., and the rate of advancement was 9½ ft. per day. All the efforts of the engineers to accelerate the work were for several years unavailing; and in Oct., 1866, just one-half the distance, or 6,680 yds., had been pierced, showing the same constant rate of 9½ ft. per day. At this rate, the tunnel would not have been completed till 1872. Owing, however, to improved modes of working, and to a favorable change in the nature of the rock, the rate of advancement became greater toward the end, and the two parties met on Dec. 25, 1870. The tunnel was formally opened in Sep., 1871. A premium was to be paid by the French government to the Italian government, which did the work, for each year by which a term of 25 years, counting from 1862, was reduced. France was also to pay \$6,435,000 for one-half the tunnel when completed.

This great work, which appeared almost impracticable to ordinary methods of tunneling by manual labor, was rendered practicable by machinery introduced by the engineers, Messrs. Sommeiller, Grandis, and Grattoni. The great difficulty lay in the fact that, from the great height of the mountain, shafts were impracticable, and progress could only be made from each end. The ventilation also presented serious difficulties. M. Sommeiller perfected a small machine, weighing 6 cwt., which bored a hole 1½ in. diameter and 3 ft. deep in twenty minutes; the time taken by two miners working by the ordinary method being two hours. Eleven of these machines were placed on a movable support, and were capable of working at almost any angle. Three or four large holes were bored in the center of the heading, and round these other holes of the ordinary size, in all 80 holes. The large holes were not fired, but were for the purpose of weakening the rock. The others were then fired in succession and in detachments, beginning with those nearest the center, and working outward. The machines were worked by compressed air acting, like high-pressure steam, on a piston in a cylinder; this air being compressed outside the tunnel by water-power acting on the hydraulic-ram principle, and also by an air-pump; it was used at a pressure of five atmospheres above the atmospheric pressure, and was conveyed to the workings by a pipe 7½ in. diameter. After it had expended itself in working the borers, it escaped into the tunnel, and so ventilated the workings. The advanced heading was the only place where these machines were used. During the construction, a temporary locomotive railway was laid along the road over the pass.

The St. Gothard tunnel is a still more stupendous enterprise. It was begun in January, 1871; and, 1880, Feb. 29, the borings from the Swiss and Italian sides met, though much time and labor were still required to prepare the tunnel for railway traffic. The total length is 9½ miles, the width 21½ feet. The average rate of progress was 18 ft. per day; the improved M'Kean drill, latterly used, cut its way at the rate of twelve inches per minute. The contract of the tunnel was near two millions sterling, but the actual cost, including approaches, is given at several millions more. France proposes a tunnel through the Simplon. A tunnel connecting England and France beneath the English channel, for which a company was formed in 1872, would eclipse all former undertakings; its length would be 31 miles. But the British government has declined to sanction the undertaking. The Arlberg tunnel, begun in the middle of 1880, was ready for use in Nov. 1884. It is slightly over six miles in length, and its connections on both ends being complete, it gives direct railway communication between the Austrian province of Vorarlberg, touching Lake Constance, and Innsbruck in the Tyrol.

One of the most important railway tunnels in the United States is the Hoosac tunnel in Berkshire co., western Mass., owned by the state, is an important part of the Fitchburg railway from Boston to the west. The e. end of the tunnel is 137 m.

* This is really a misnomer; the tunnel is at a considerable distance from Mont Cenis, and the chief summit under which it passes is the "Grand Vallon" (11,000 ft. high).

from Boston. Some preliminary work was undertaken in 1851, but the actual cutting of the mountain did not begin till 1856. In 1862 the work came into the hands of the state, which brought it to completion. The tunnel is $4\frac{1}{2}$ m. long, running through micaceous schist, and of sufficient width to permit the laying of two railway tracks. The work of cutting was chiefly done by pneumatic drills. The entire cost of the tunnel is not easily stated, but with some 40 m. of railroad, it probably approached \$15,000,000. It is now in constant and successful use, and few lives have been lost in the work of its construction.—A subaqueous tunnel to supply the city of Chicago with pure water from lake Michigan extends 2 m. into the lake easterly, having two shafts, 6 and 7 ft. in diameter. Work was begun on the first shaft in 1864 and completed in 1867; the second was finished in 1874. On the crib, 2 m. in the lake, is a light-house and keeper's house. The entire cost of the city water-works up to 1874 was somewhat more than \$5,000,000. The chief difficulty encountered in the construction of this tunnel was from explosive gas, and several accidents occurred from this cause, none of which, however, were fatal. The quality of the water thus furnished to the city has been as a rule very good, though in the summer of 1881 unusual causes drove the city sewage for a short time to the mouth of the crib. Somewhat similar tunnels have been built at Buffalo, N. Y., and Cleveland, Ohio. The latter is 6,660 ft. long and 5 ft. in diameter. In its construction difficulties were encountered, as at Chicago, from volumes of inflammable gas, which from time to time entered it and exploded. Some lives were thereby lost. The work was begun in 1869 and finished in 1874, at a cost of somewhat less than \$350,600.—A railway tunnel under the Hudson river at New York is designed to give that city railway connection with the west. Work is still (1891) being carried on, and a similar tunnel to connect the cities of Brooklyn and New York has been projected.—Of the various mining tunnels in the United States, the most notable is that at Sutro, Lyon co., Nev., about 10 m. s. of Virginia City. The tunnel, which opens the Comstock lode of silver, is about 4 m. long, and has cost about \$5,000,000. See CENIS, MONT, GOTHARD, ST., CHANNEL TUNNEL. A tunnel two and a half miles in length, and twenty-three feet high, was finished in 1891, through the Khwaja Ameran mountains in India, and known as the Khwaja Tunnel.

TUNNY. *Thynnus vulgaris*, a fish of the family *scomberidae* (q.v.), found in the Mediterranean, and in the Atlantic ocean, but particularly abundant in the Mediterranean, where the tunny fishery is of great importance. It occasionally, but rarely, occurs on the British coasts. The genus *thynnus* is closely allied to *scomber* (see MACKEREL), but has the dorsal fins close together, the detached finlets more numerous. The tunny is a very large fish, sometimes 9 ft. in length, and weighing 1000 lbs., or even more. Its form is much thicker than that of the mackerel; its tail so widely forked as to be crescent-shaped. It is very plentiful near Constantinople, where it appears in shoals, sometimes so crowded that it may even be taken with the hand. The chief tunny fisheries of the present day, however, are on the coasts of Spain, Italy, and Sardinia. The Phenicians established a tunny fishery at a very early period on the coast of Spain, and the tunny appears on Phenician medals of Cadiz and Carteia. Salted tunny was much esteemed by the Romans, and was called *saltamentum sardicum*. The tunny is generally captured by means of nets arranged in a funnel-like form, the fish entering the wide mouth of the funnel, and being gradually driven to the narrow end, where they are killed by lances and harpoons. The line of nets is often more than a quarter of a m. long, and costs about \$6,000.—The AMERICAN TUNNY (*thynnus secundo-dorsalis*) is found on the coasts of New York, and thence northward to Nova Scotia. It sometimes attains a length of 12 feet. It is nearly black above, silvery on the sides, and white below. Its flesh is much esteemed. It also yields much oil, which is obtained by boiling the head and the belly. Twenty gallons of oil are often obtained from a single fish.

To the same genus with the tunny belong the bonito (q.v.) and the albacore or albacore (*T. albacorus*) which inhabits the West Indian seas, and is esteemed for the table. The name albacore, however, seems to be often given to different species of this family, inhabiting tropical seas, and sometimes to the tunny itself.

TUNSTALL, a prosperous market-t. of England, in the co. of Stafford. There are manufactures of iron, and pottery and tiles. Pop. '81, 14,244; '91, 15,730.

TUNSTALL or **TONSTALL**, CUTHBERT, 1474–1559; b. England; educated at Oxford and Cambridge, and studied at Padua; was rector of Harrow-on-the-Hill, 1511; archdeacon of Chester, 1515; master of the rolls, 1516; sent as commissioner to Brussels; dean of Salisbury, 1521; bishop of London, 1522; lord privy seal, 1523; ambassador to Spain, 1525, and France, 1527; bishop of Dunham, 1530; deprived of his bishopric, 1552, and committed to the Tower on a charge of treason; reinstated by Mary, but declining the oath of supremacy to Elizabeth was again deprived, 1559. He published *In Laudem Matrimonii*; *Compendium and Synopsis*, an abridgment of Aristotle's *Ethics*.

TUOLUMNE, a co. in central California; 2048 sq.m.; pop. '90, 6082, chiefly of American birth, with colored. In this county is Table mountain, 30 m. long and 6288 ft. high, with steep, perpendicular sides. Co. seat, Sonora.

TUPELO, *Nyssa*, a genus of trees of the natural order *alanziaceæ*, natives of North America, chiefly of the southern parts of the United States; having simple alternate leaves

mostly entire, greenish, inconspicuous flowers at the extremity of long stalks, the fruit a drupe. *N. villosa* attains a height of 60 to 70 feet. It is often called BLACK GUM TREE. *N. tomentosa*, the LARGE TUPELO, is a lofty and beautiful tree, remarkable for the extraordinary enlargement of the base of the trunk, which is sometimes 8 or 9 ft. in diameter, while at no great height the diameter diminishes to 15 or 20 inches. The fruit resembles a small olive, and is preserved in the same way by the French settlers in America. *N. candicans* or *capitata*, the OGEECHEE LIME or SOUR GUM TREE, is a small tree.

TUPPER, SIR CHARLES, Canadian statesman, b. in Amherst, Nova Scotia, in 1821. He studied medicine in Edinburgh, receiving the degree of M.D. In 1855 he was elected to the provincial parliament in Nova Scotia, and subsequently held the following offices: Provincial Secretary (1856); Premier (1867); President of the Council (1870); Minister of Inland Revenue (1872); Minister of Customs (1873); Minister of Public Works (1878), subsequently taking the portfolio of Railways and Canals. In 1867 he was made a C.B.; and in 1879, a Knight of the Order of Michael and George. He took a prominent part in Canadian federation, and enthusiastically aided the building of the Canadian Pacific Railway. In 1883 he was made Canadian High Commissioner at the English court; reappointed in 1888; was prime minister of the Dominion of Canada for a short time in 1896.

TUPPER, MARTIN FARQUHAR, D.C.L., F.R.S., a poet rather popular than great, was b. on July 17, 1810. His father, Martin Tupper, was a well-known London surgeon, of a family originally German, which had long been settled in Guernsey. Martin Tupper was educated at the Charter-house, and afterward at Christ Church, Oxford. On leaving college, he entered himself as a student at Lincoln's Inn, and was called to the bar in 1835; but literature had more charms for him than the law, which he never seriously prosecuted. In 1832 he published anonymously a small volume of poems, which attracted little attention. For this lack of success, he was, however, amply repaid on the appearance, in 1839, of his *Proverbial Philosophy*. The popularity of this work in England, and still more in America, has ever since been immense, and almost unprecedented. The critics have indeed been less kind to it than the reading public; and the fame of Mr. Tupper was long a topic of mirth to the wits of the literary guild; but from the serene height of his fortieth edition an author could perhaps afford to smile at the attacks of the envious generation below. A fair criticism would probably adjudge that, while there is nothing in Mr. Tupper's *Proverbial Philosophy* to justify its enormous success—so far as mere circulation is success—the book is yet something better than the mere conglomeration of stupid platitudes which its detractors so confidently proclaim it to be. Besides this work, on which his reputation—such as it may be—rests, Mr. Tupper published *The Crock of Gold*, a tale; *Geraldine*, a sufficiently ludicrous attempt to complete Coleridge's inimitable fragment *Christabel*; with various other works in prose and verse, which it is quite unnecessary to enumerate, inasmuch as no one of them succeeded in making the least impression on the public. He d. 1889.

TU QUOQUE ARGUMENT. See ARGUMENTUM AD HOMINEM.

TURANIAN LANGUAGES. In opposition to *Iran*, the name of their own country, the Persians from the earliest times called the countries lying to the n. of it Turan, and this name is still frequently used as synonymous with Turkistan. The term Turanian derived from it has been adopted by philologists, in contrast with Aryan (q.v.), to designate a family of languages comprising "all languages spoken in Asia and Europe (including Oceania), and not included under the Aryan and Semitic families, with the exception of Chinese and its cognate dialects." The languages of this family are of the agglutinate order (see PHILOLOGY). Max Müller classes them in two great divisions, the northern and the southern. The northern division falls into five sections—the *Tungusic*, *Mongolic*, *Turkic*, *Finnic*, and *Samoyedic*. Of these, the Tungusic dialects, which extend n. and w. from China, are the lowest in organization, being, some of them, nearly as destitute of grammatical forms as the Chinese. The Mongolic dialects are superior to the Tungusic, although the different parts of speech are hardly distinguished; both branches, however, are believed to be manifesting symptoms of grammatical development. The Turkic dialects, of which the Osmanli or Turkish of Constantinople is the most prominent, occupy an immense area, extending from the Lena and the Polar sea to the Adriatic. They are extremely rich in grammatical forms, especially in the conjugation of the verb. The most important members of the Finnic class are the Finnic of the Baltic coasts (see FINNS), and the Hungarian language, or Magyar (see HUNGARY).

The southern division comprises, among others, the *Tamulic* or Dravidian dialects of southern India (see TAMIL); the *Gangetic* group, in two branches, the trans-Himalayan or Thibetan (see THIBET), and sub-Himalayan (Bhotanese, etc.); the *Taic*, or the dialects of Siam; and the *Malaic*, or Malay and Polynesian dialects. The Turanian languages do not present the same unmistakable family likeness, the same clear evidences of genealogical relationship, as are presented by the Aryan and Semitic groups. The nature of their structure, and the nomadic character of the peoples speaking them, are sufficient to account for their exceeding diversity, even supposing them to have all sprung from the same original stock. "The only characteristic Turanian feature which always remains is this: the root is never obscured. Besides this, the determining or modifying syllables are generally placed at the end, and the vowels do not become so absolutely fixed for each syllable as in Sanskrit and Hebrew. On the contrary, there is what is

called the law of harmony, according to which the vowels of each word may be changed and modulated so as to harmonize with the key-note struck by its chief vowel. The vowels in Turkish, for instance, are divided into two classes, *sharp* and *flat*. If a verb contains a sharp vowel in its radical portion, the vowels of the terminations are all sharp; while the same terminations, if following a root with a flat vowel, modulate their own vowels into the flat key. Thus we have *sev-mek*, to love, but *bak-mak*, to regard, *mek* or *mak* being the termination of the infinitive. Thus, we say, *so-ler*, the houses, but *at-lar* the horses, *ler* or *lar* being the termination of the plural."—Max Müller's *Science of Language*, 1st series.

TURBARY, in the law of England, is a right to go upon the soil of another and dig turf, and carry away the same. It is classed under the head of a *profit à prendre*, and is generally traced to some ancient custom of a manor, or is proved by prescription, or long use for 30 years and upward.

TURBINE. See WATER-POWER.

TURBIDINÆ, a family of gasteropodous mollusks, having a spiral shell with a narrow entire aperture. The species are numerous; some of them are found on the British coasts. They are numerous and widely distributed. Some are large, others small; some are very beautiful. The beautiful pheasant-shells (*phasiunella*) of the South seas are referred to this family.

TURBOT, *Rhombus maximus*, a fish of the family *pleuronectidæ*, or flat-fishes, the most valuable of them all. The genus *rhombus* has the body rhomboidal; the dorsal fin commencing immediately above the upper lip, and extending almost to the tail-fin; the eyes generally on the left side. The brill (q.v.) belongs to it as well as the turbot, and some other less important fishes. The turbot attains a large size, sometimes 70 to 90 lbs. weight. Its form is shorter, broader, and deeper than that of almost any other flat-fish. It is of a brown color on the upper surface, which is studded with hard roundish tubercles. Like the other flat-fishes, it generally keeps close to the bottom of the sea; and it is found chiefly on banks where there is a considerable depth of water. Some of the banks in the German ocean abound in turbot—as the Dogger bank—and yield great quantities to the London market. The turbot, however, is also found, although more sparingly, in estuaries. In former times it was chiefly caught by long lines; but of late the greater part of the supply for the London market is obtained by beam-trawling (see TRAWLING). Few kinds of fish are more prized for the table than the turbot.—The AMERICAN or SPOTTED TURBOT (*rhombus maculatus*) is also highly esteemed for the table. It is common on the coasts of New England and New York. It attains a weight of 20 lbs. The breadth is about one-half of the length. The upper surface is smooth, reddish-gray, with large circular or oblong darker blotches, and numerous white spots.

TURDIDÆ. See MERULIDÆ.

TURENNE, HENRI DE LA TOUR D'AUVERGNE, Vicomte de, one of the most eminent of France's military heroes, was the second son of Henri, duke of Bouillon, and Elizabeth of Nassau, the daughter of William I. of Nassau-Orange, the great assertor of the liberties of the Netherlands, and was born at Sedan, in the dep. of Ardennes, Sept. 11, 1611. Brought up in the Reformed faith, he was sent, on the death of his father in 1623, to Holland, where, under his uncle, the celebrated Maurice (q.v.), he was initiated into the art of war. Returning to France in 1630, he was favorably received by Richelieu, who at once gave him a commission. In 1637 he was attached to the army of Bernard of Weimar, which at that time was engaged in Lorraine; and by bringing about the capture of Landrecies, Maubeuge, and other places, including the key of western Germany, Brisach, gained such repute, that on his return to Paris (1638), he experienced quite a triumphal reception. The victories of Route and Casale in the Italian campaign of the following year, added to his laurels; and in 1641 he was for the first time intrusted with the supreme command. The rapid and thorough conquest of Roussillon from the Spaniards in 1642, was good proof of his masterly military genius, and was rewarded in 1644 with the baton of a marshal of France, and the chief command on the Rhine, where repeated reverses, a defective commissariat, and want of pay, had completely demoralized the army. But through a liberal expenditure of his own funds, and of loans obtained by him on his own security, the troops were speedily re-equipped; and by a victory over the Bavarians at Rottweil (1644), their *morale* was restored. Condé's arrival transferred him to a subordinate position; and his restoration to supreme command was followed by the commission of a glaring strategic error, for which he was severely punished by his able and watchful opponent, Mercy, who completely routed him at Marienthal, May 5, 1645; but on Aug. 3 of the same year, this disgrace was amply avenged by Condé at Nordlingen, where Mercy was slain; and Turenne gloriously concluded the war on the part of France by the reconquest of the Treves electorate, by the conquest of Bavaria in conjunction with the Swedes, and by a successful campaign in Flanders. In the civil wars of the Fronde (q.v.), which immediately followed, Turenne joined the party of the *frondeurs*, of whom his elder brother was one of the principal leaders; but after being defeated at Rethel (Dec. 15, 1650), he withdrew to Flanders, returning on Mazarin's retirement. On the minister's return, Turenne joined his party, while Condé deserted to the *frondeurs*, and the two greatest generals of the period were for the first time pitted against each other. Turenne was

uniformly victorious over his former chief, though his forces were inferior in number; and ultimately forced him to retire from France; after which he subdued the revolted cities, crossed the northern frontier, and conquered much of the Spanish Netherlands. In 1667, on the outbreak of war between France and Holland, Louis XIV. made him marshal general of France, and would have made him constable, had he not been a Protestant. Indeed, the unorthodoxy of Turenne had for some time been a matter of grave concern to the bigoted young monarch, at whose suggestion Bossuet attempted the veteran's conversion by composing his celebrated *Exposition de la Doctrine Chrétienne*, which, backed by the king's repeated solicitations and remonstrances, and doubtless, as Voltaire suggests, by the more efficacious promptings of ambition, had ultimately the desired effect. Turenne's campaign in Holland, in which he was nominally under Louis's command, was a most triumphant one; and the elector of Brandenburg, who had ventured to side with the Dutch, was pursued to Berlin (1672), and forced to beg for peace. The emperor next took up arms on behalf of Holland, whereupon Turenne was transferred to the Upper Rhine. This, his last campaign, is foully disfigured by the horrible devastation of the Palatinate, executed under express orders, doubtless, but with a willing thoroughness which is utterly unjustifiable. After routing the Germans at Mulhausen and Turckheim, and forcing them across the Rhine, he was at last opposed to a worthy antagonist in Montecuculi (q.v.); but, unfortunately, their famous passage of strategy of nearly half a year's duration was left unfinished. Turenne being killed while reconnoitering the ground at Salzbach, with a view to a grand engagement. His grateful sovereign, to show that he made no distinction *entre porter le sceptre, et le bien soutenir*, ordered him to be entombed at Saint Denis, and funeral orations were pronounced for him by Flechier and Mascaron. On the desecration of Saint Denis during the revolution, Turenne's monument suffered with the rest, and was ultimately placed by Napoleon under the dome of the Invalides. Turenne has left memoirs of his campaigns from 1643 to 1658, which are of considerable interest to the student of history. Many biographies of this eminent warrior have been written, by Raguenet, Ramsay, Buisson, D'Avrigny, etc.

TURF. See HORSE RACING.

TURF LAWS. The laws concerning the ancient pastime of horse-racing are subdivided into those affecting races, wagers, and betting-houses, for which last, see BETTING. 1. As to racing. The stewards or persons intrusted with the management and possession of the land for the time have a right, which is seldom enforced, to turn off any person they please from the grounds. Many of the great races are not run within a year from the time the horses are entered. The owner of a horse entered can withdraw or "scratch" him before the race is run. When the race is run, the successful party may sue for the amount of the stakes; and if the race is not run, or cannot be run, each subscriber may sue for recovery of his contribution. If the stakes are contributed for an illegal game, it is otherwise; and before the stakes have been paid away, any contributor may sue for and recover his deposit; but he ought also formally to demand it back. The stewards decide all disputes about the fairness of a race, and their award is binding: if they cannot agree, then it will fall to be decided by a jury.—2. As to wagers. But by the ordinary statutes of wagers, all wagers were declared void, except as regards subscriptions of money or plate to be awarded to the winner of a lawful game, sport, pastime, or exercise. If one makes a wager on a race, he may retract it at any time before the event comes off, and require the money, if deposited, to be repaid; and no wager can be tried in any court of law or equity, so that the winner cannot compel payment. It is merely a debt of honor.

TURGENEFF, ALEXANDER IVANOVITCH, 1784–1845; b. Russia; traveled extensively in Germany, Italy, France, and Denmark, making investigations in regard to the mediæval history of Russia. He published *Historiæ Russiæ Monumenta*, 2 vols. (1841–42); and *Supplementum* (1848).

TURGÉNEFF, IVAN SERGÉYEVITCH; Russian author; b. Orel, Oct. 28, 1818; d. Bougival, France, Sept. 3, 1883. He was educated at Moscow, St. Petersburg, and the university of Berlin. After his return to Russia he obtained a situation in the office of the minister of the interior. His first published work was a poem, *Parasha* (1843); his first story, *Andreï Kolosov*, appeared in 1843. In 1852 he was imprisoned, owing to an article he published on *Nicholas Gogol*, and was then interned at his estate for two years. After 1855 he lived in Baden-Baden and in Paris, visiting Russia at intervals. Until within a few years before his death he was unpopular in Russia, and was especially disliked by the Liberals, by whom he was denounced as a reactionist. The last works that appeared from his pen, his exquisite poems in prose (1882), and a mystical novel, *Clara Militch*, revealed his patriotism—often called into question—and his sorrow at being misunderstood by his friends. Extremely sensitive to the sensuous impressions of life, he yet possessed the religious impulses, with a deep insight into the complexity of the soul. His writings give a large account of life, dealing with all classes, types, degrees of fortune, and phases of manner; but they are tinged with a sadness bordering upon pessimism, and with that fatalism which is noticeable in the writings of George Eliot. His other writings include the novels: *Fathers and Sons* (1862), perhaps his masterpiece; *Smoke* (1867); *Virgin Soil* (1876), and numerous short sketches, tales, etc.; *Two Friends* (1853); *Still Life* (1854); *Dimitri Rudin* and *Faust* (1856); *A Nest of Noblemen* (1859); *On*

the Eve and First Love (1860); *Visions* (1861); *The History of Lieut. Jergunov* (1866); *The Brigadier* (1866); *King Lear of the Steppe* (1870); *An Unfortunate Woman* (1868); *Tschertopchanov's End* (1872); *The Dream* (1876), etc. A new English edition, by Mrs. Constant Garnett, was in course of publication in 1897.

TURGÉNEFF, NIKOLAI, 1790-1871, b. Russia; educated at Göttingen. He entered the Russian civil service, and in 1813 was associated with baron Stein in governing the German provinces taken from France. He was afterward deputy secretary of the interior and agriculture. He advocated the emancipation of the serfs, and in 1825 was sentenced to death for his connection with the attempt at revolution in 1825. He escaped to Paris, where he published *La Russie et les Russes* (1847).

TURGOT, ANNE ROBERT JACQUES, French statesman, b. in Paris, May 10, 1727, was descended from one of the oldest families in Normandy. Turgot was destined for an ecclesiastical career, but adopted by preference the profession of law. In 1761 he was appointed intendant of Limoges, and administered the affairs of the province for thirteen years. He introduced a more equitable administration of imposts, and succeeded in abolishing the old method of repairing roads and bridges by the compulsory labor of the poor inhabitants of the district, called *corvées*. He also exerted himself in providing for the subsistence of the people and the protection of commerce. He introduced into the Limoges the cultivation of potatoes. A wider field opened before him on the death of Louis XV. The finances were in a terrible state of disorder, the whole social and political system of France needed regeneration and reform; and Turgot appeared to be the man to meet the crisis. He was first made minister of marine, and afterward comptroller-general of France, when to fill that post was to be virtually the prime minister. In his letter to Louis XVI., he adopted, as the principle of his administration, that there should be "no bankruptcy, no augmentation of imposts, no loans;" yet he foresaw that the strength of the privileged classes; and the corrupt influence of those who profited by abuses, would be too much for him, and that against such enemies he could hardly hope to retain the confidence of the king. His first task was so far to reduce the expenditure as to leave a surplus of 20 millions of francs a year, to be applied to the liquidation of old debts. He augmented the public revenue without imposing new taxes, and he introduced exactness of payments and fidelity of engagements into all his financial operations. One of his first measures was the carrying out of free-trade in corn throughout the interior of the kingdom. He constantly occupied himself with the amelioration of the condition of the people. He proposed to enfranchise the rural districts from statute labor, provinces from their barriers, commerce from internal duties, trade from its shackles, and lastly, to make the nobility and clergy contribute to the taxes in the same proportion as the third estate. This great minister and virtuous citizen, of whom his colleague, Malesherbes, said: "He has the head of Bacon, and the heart of L'Hopital," wished, by means of provincial assemblies, to accustom the nation to public life, and prepare it for the restoration of the states-general. If the nobility and privileged classes had possessed enough of foresight and patriotism to submit to his plans for reforming France, she might have been spared the horrors and excesses of the revolution. But his projects for the public good were defeated by the confederacy formed against him by nobles, courtiers, farmers of the revenue, and financiers. The king forsook him, although, at the same time, observing that Turgot and himself were the only persons who desired the welfare of the people. He retired, having held office for only twenty months. It is alleged against his practical talent for statesmanship, that he labored under a want of address, and that he did not sufficiently dissemble his hatred and contempt for the cowardice and baseness of those who fattened upon the abuses that were eating like an ulcer into the heart of France. After his retirement, he resumed his early worship of the muses. His Latin inscription for the portrait of Franklin is a line of which any author might be proud: "*Eripuit celo fulmen, sceptrumque tyrannis.*" He also devoted himself to physics and mathematics. His works are a mine of sound and original thought. His *Mémoire* on the American war expresses views on the nature of colonies which have since been adopted by the best writers. His work on *Usury* contains almost all that is of value in Bentham's *Letters on the Usury Laws*. He held general objections to charitable institutions. He died of gout, Mar. 20, 1781, leaving behind him a memory which France will ever cherish with veneration.

TURIN (*Augusta Taurinorum, Bodincomagus, Colonia Julia, Taurasia*—in Italian, *Torino*), a city of northern Italy, formerly capital of Piedmont, then of the kingdom of Italy, is situated near the confluence of the Po and the Dora Ripaira, 45° 4' n. lat., 7° 42' e. long. Its pop. at the beginning of this century was 42,000—in 1863 it was 235,000; in 1895 it was 345,000. It began to acquire importance when Amadeus V. declared it the capital of Savoy in 1418; built a castle there, and made it his residence. In 1620 Charles Emanuel I. enlarged the city by royal decree: it was still more enlarged in 1673 and in 1702. At the beginning of this century the French destroyed and leveled the ramparts of the town, converting them into public promenades. Of late years the moats and fortifications have been demolished to make way for new streets toward Pota-Susa. In consequence of these improvements Turin has become one of the handsomest cities in Europe. It is famed for its handsome squares. Some of the finest are—Piazza Carlo, surrounded by wide porticoes, and adorned by a fine equestrian statue of Emanuel Philibert of Savoy, by Marochetti; Piazza Castello, also surrounded by

porticoes, which are prolonged down via Po to the end of Piazza Vittorio Emanuele, the finest square in Europe for size, regularity of architecture, and beauty of situation; Piazza Carlo Felice, with porticoes and a fine garden; Piazza Carlo Alberto, with an equestrian statue of the king of that name by Marochetti; Piazza d'Armi, a vast open space for military exercises, flanked by the old and new arsenals of the kingdom. Leading out of Piazza Vittorio Emanuele, there is a handsome five-arched bridge across the Po, begun by Napoleon I., with money got by the sale of the jewels and votive offerings of the cathedral, and finished by the kings of Sardinia. Another fine bridge is that across the Dora, of one single arch, nearly straight, the work of the engineer Mosca. Among the numerous churches, the principal are the cathedral of San Giovanni, a Gothic structure built in the 7th c. and reconstructed 1492-98; San Filippo, the handsomest church in Turin; La Consolata; La Gran Madre di Dio; and a Waldensian temple. On the summit of a hill near the town is La Superga, a splendid basilica, raised by Victor Amadeus II. to fulfil a vow, and now the mausoleum of the house of Savoy. Among the "palaces" must be noticed the royal palace designed by Castellamonte, which is poor in outward appearance, the Carignano palace, an odd building, by Guarini; the town-hall, designed by Lanfranchi; the university, with 85 professors and about 2300 students, a library of 200,000 vols., and 3000 MSS.; the Accademia delle Scienze, with an Egyptian museum, the finest in Europe; the seminary; the hospital of San Giovanni. The private palaces are numerous and vast, but in a bad style of architecture. There is the theater royal; the Carignano theater, designed by Alfieri; the Vittorio Emanuele, and many other theaters.

The manufactures of Turin consist of woolen and silk fabrics, matches, paper, pottery, leather, arms and liquors. The population is sober, industrious, and generally well off.

Turin was originally inhabited by the Taurinians, a tribe of Ligurians. It is first mentioned in history in the time of Hannibal, by whom it was taken and sacked, on his descent into Italy after crossing the Alps. Turin became a royal colony 166 B.C., and was called by Augustus, *Augusta Taurinorum*. On the fall of the empire it went to the Lombards, and became the capital of one of the 30 Lombard duchies. Charlemagne made it the residence of the duke of Susa, whose line ruled till 1032, when the house of Savoy succeeded it. It was taken by the French in 1506, and held by them for nearly 60 years. They again took it in 1640; and in 1796 it was dismantled, and united to the French empire in 1800 with the name of the department of the Po. In 1815 it was restored to the house of Savoy. From 1861-65 it was the capital of United Italy. The city is also eminent for having been the birthplace of many men of mark, among whom may be mentioned Cesare Balbo, D'Azeglio, and Cavour, all prominent statesmen; Gioberti, the philosopher and writer; Marochetti, the sculptor, and Lagrange, the mathematician.

TURKESTAN, or TOORKISTAN. See TURKISTAN.

TURKEY *Meleagris*, a genus of gallinaceous birds of the family *pavonidae*, or, according to some ornithologists, of a distinct family, *meleagridae*, both, however, being included by others in *phasianidae*. The head is bare, the neck wattled, and the bill of the male surmounted with a conical fleshy caruncle, sometimes erected, sometimes elongated and pendulous. A curious tuft of long hair springs from the base of the neck of the male, and hangs down on the breast. The bill is rather short, strong, and curved, the tail is broad and rounded, capable of being erected and spread out, as the male delights to do when he struts about in pride, with wings rubbing on the ground, uttering his loud peculiar *gobble*. The COMMON TURKEY (*M. gallo-pavo*), the largest of gallinaceous birds, well-known as an inmate of our poultry-yards, is a native of North America. It appears to have been introduced into Europe in the beginning of the 16th c., and is naturalized in some places, as it may be said to have been in the royal park of Richmond, near London, in the first half of the 18th century. In a domesticated state the turkey varies much in plumage; in its wild state this is not the case. The plumage of the wild turkey is also richer, and its power of wing greater; but the wings even of the wild bird are short, scarcely extending beyond the base of the tail. The darkest-colored of domesticated turkeys most nearly resemble the wild turkey in plumage. In its native woods it seems to attain even a larger size than in the poultry-yard. Turkeys were once plentiful in the forests of the Atlantic states of North America, and as far n. as lower Canada, but have disappeared as cultivation has advanced, and have become rare even in the eastern parts of the valley of the Mississippi, where their numbers were once very great. The turkey is found as far s. as the isthmus of Darien, but does not occur to the w. of the Rocky mountains. It inhabits the woods of the larger islands of the West Indies. In warm climates it is said to produce two or three broods a year; but in colder countries it produces only one. The males associate in flocks of from 10 to 100, and seek their food during great part of the year apart from the females, which go about singly with their young, or associate in flocks, avoiding the old males, which are apt to attack and destroy the young. At the pairing-time desperate combats take place among the males. Wild turkeys roost on trees. They feed on all kinds of grain, seeds, fruits, grass, insects, and even on young frogs and lizards. They make their nests on the ground, merely gathering together a few dry leaves, and often

in a thicket. The eggs are usually from 9 to 15 in number, sometimes 20. They spread themselves in summer over the higher grounds; but in winter congregate in the rich low valleys. The sexes mingle in winter and form larger flocks than in summer.

On account of its size, and the excellence of its flesh and eggs, the turkey is one of the most valued kinds of poultry. The management of it differs little from that of the common fowl. The young are tender for the first few weeks, and require care, particularly to keep them from getting wet by running among the wet grass, or the like; but afterward they are sufficiently hardy. Nettles are excellent food for turkeys, and are often chopped up for them, to be given in addition to grain, bran, boiled potatoes, and other such food.

Another known species of turkey is *Meleagris ocellata* (Cuv.), a native of Honduras. It is not quite so large as the common turkey, and has a smaller tail. The neck is less wattled, but the head has a number of fleshy tubercles. The plumage is beautiful, rivaling that of the peacock in metallic brilliancy: blue, green, bronze, red, and golden hues being intimately and finely mingled, and forming eyes on the tail; whence the specific name. A variety of our common turkey, *gallopavo*, the *M. Mexicana* of Gould, inhabits the table lands of the southern United States and Mexico. Extinct species are represented by *M. altus* and *M. celer* (Cope) from the post-pliocene beds of New Jersey, and *M. antiquus* (Marsh) from the miocene beds of Colorado. Audubon chose the wild turkey as a device for his private seal, and it is said that when it was proposed to select some bird for an emblem of the new American republic, Benjamin Franklin suggested the wild turkey, this being peculiar to the western continent.

TURKEY, or the **OTTOMAN EMPIRE** (q.v.), includes large portions of the continents of Europe, Asia, and Africa, and consists of Turkey proper, which is under the direct rule of the sultan, and of several dependent and tributary states. The arrangements sanctioned by the Berlin congress in 1878 have largely changed the size and organization of the empire. Turkish affairs could not soon be expected to settle into equilibrium; and on most subjects trustworthy statistical results are at best approximate.

The *Statesman's Year-Book* of 1897 gave the following estimate of the area and population of the Turkish empire based on the census of 1885, still incomplete:

| | Square Miles. | Population. |
|-----------------------------------------------------------------|---------------|-------------|
| Immediate Possessions: | | |
| Europe..... | 61,200 | 4,780,000 |
| Asia..... | 687,640 | 21,608,000 |
| Africa (Tripoli)..... | 398,738 | 1,300,000 |
| | 1,447,578 | 27,688,000 |
| Bulgaria (including Eastern Roumelia), autonomous province..... | 37,860 | 3,154,375 |
| Bosnia, Herzegovina, and Novibazar, under Austria-Hungary..... | 23,570 | 1,504,091 |
| Samos, tributary principality..... | 232 | 48,500 |
| Egypt..... | 400,000 | 6,817,265 |
| | 461,662 | 11,524,231 |
| | 1,609,240 | 39,212,231 |

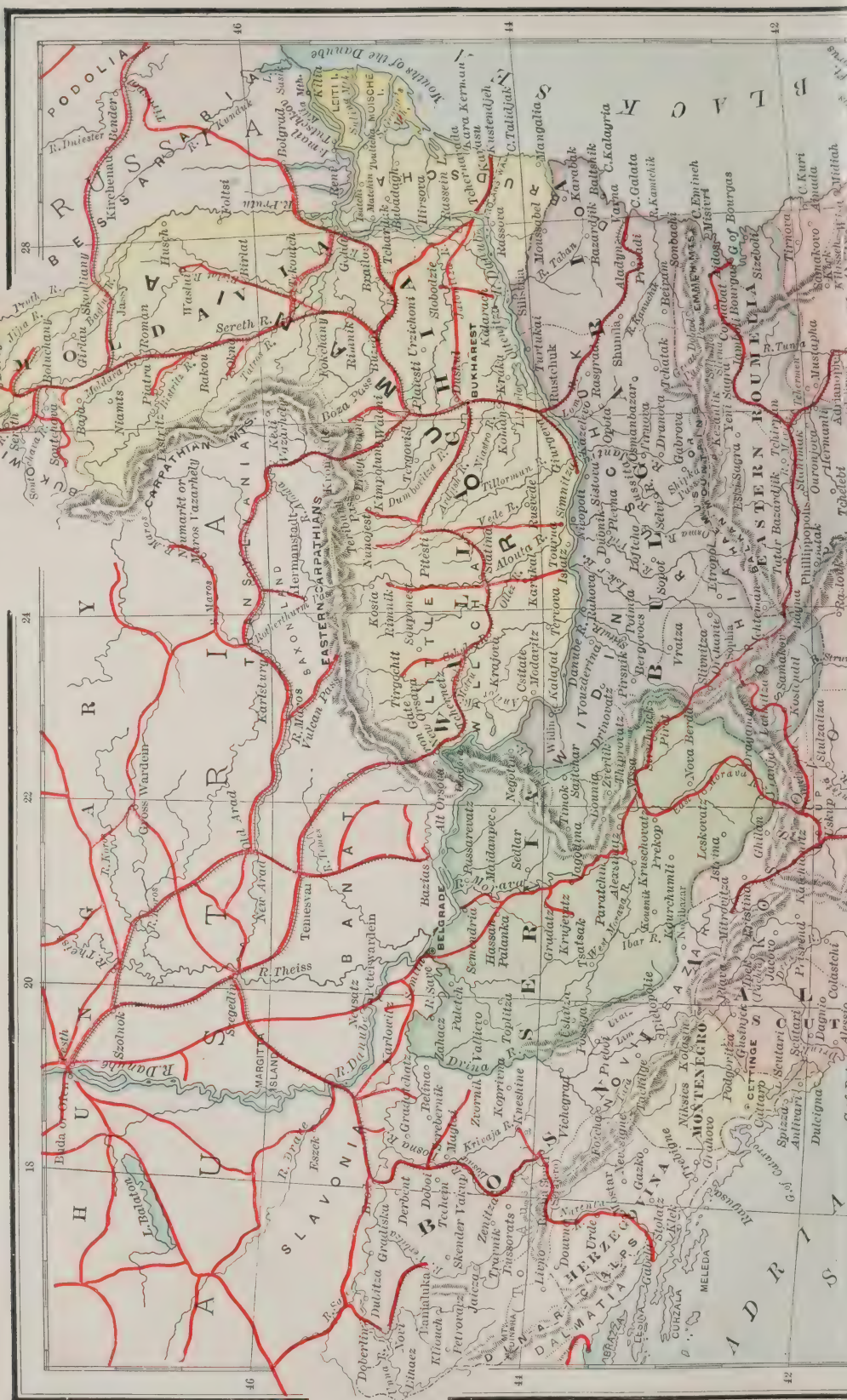
The estimates of 1885 are, of course, radically different from those made before the Berlin congress of 1878 (see History of the **OTTOMAN EMPIRE**). This congress, which met primarily to revise the "preliminary" treaty of San Stefano, concluded between Russia and Turkey at the close of the war of 1877-78, has revolutionized the relation of the Porte to the subject Christian principalities and provinces, alienated large portions of hitherto Turkish territory, and inaugurated what must necessarily be a new era in the history of the Ottoman empire. The principal results of the congress's work are treated under the several heads of the states they chiefly concern (see **ROMANIA**, **SERVIA**, **MONTENEGRO**, **BULGARIA**, etc.), but must here be briefly summarized.

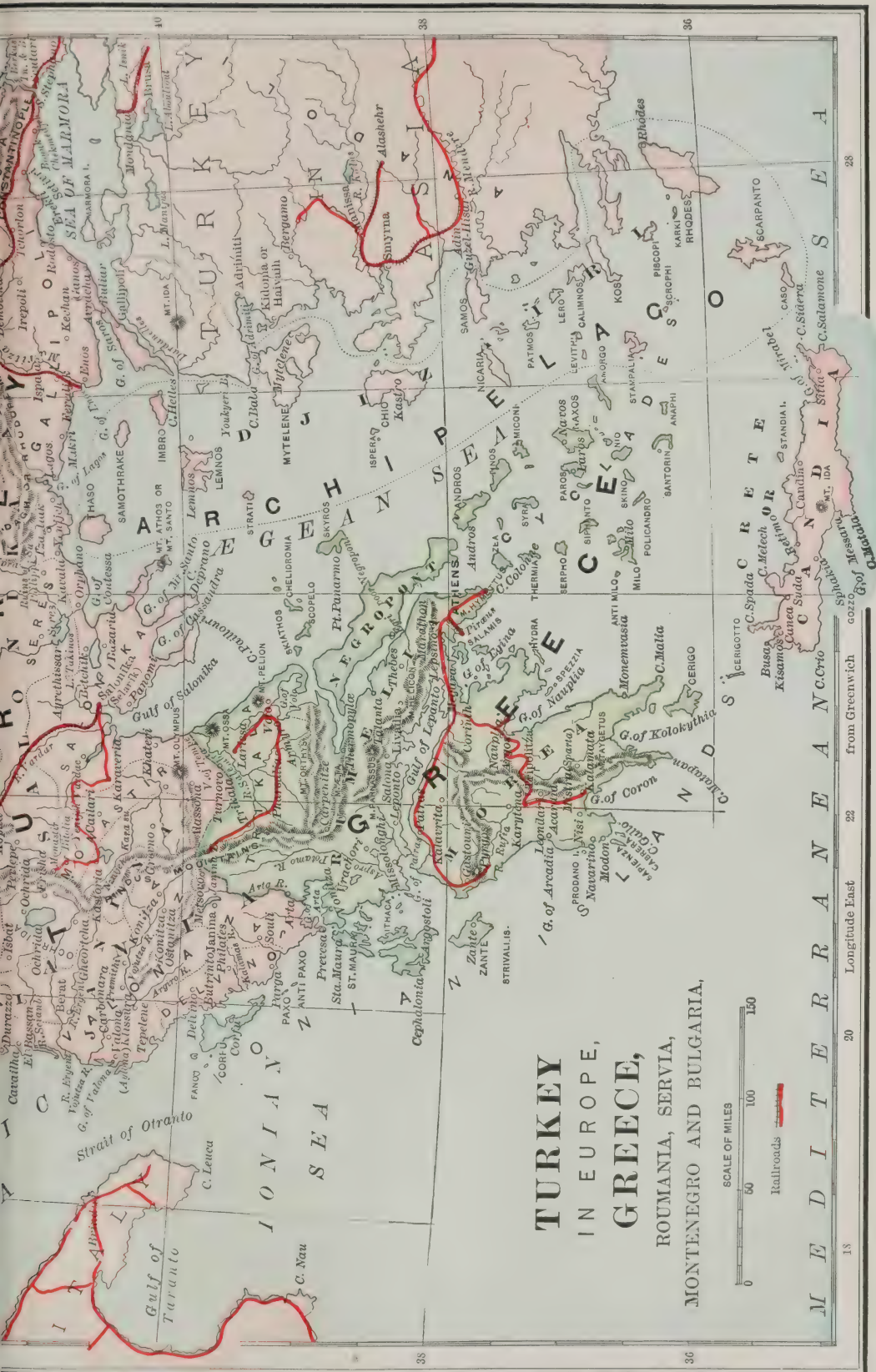
The vassal states Romania and Servia, as well as Montenegro, were declared independent, and each obtained a change or extension of territory; Romania, which had to yield up its portion of Bessarabia to Russia, received in compensation the Dobrudscha, cut off by a line from Silistria to Mangalia. Servia was considerably extended to the south. Montenegro received an addition chiefly on the Albanian side, including Antivari; and in 1880, Dulcigno, including part of the Adriatic sea-board of Antivari. What was formerly the Turkish vilayet of the Danube, was, with the exception of the Dobrudscha, now Romanian, constituted a tributary but automatic principality, its southern boundary being the Balkan range. A large territory to the s. of the Balkans was constituted into the separate province of Eastern Roumelia, and though remaining directly under the military and political authority of the sultan, secured the right of having a Christian governor-general and administrative autonomy. It was agreed that Herzegovina and Bosnia, excepting a small portion of the latter, should be occupied and administered by Austro-Hungary, and thus in large measure alienated from the porte; Spizza and its sea-board, immediately n. of Antivari, was incorporated with Dalmatia; Greece was to receive additional territory; the congress recommending that the rectified frontier should

run up the Salambria river from its mouth, cross the ridge dividing ancient Thessaly from Epirus, cut off the town of Janina so as to leave it to Greece, and descend the Kalamas river to the Ionian sea. In Crete the reformed government promised in 1866 was to be immediately and scrupulously carried out. In Asia the changes were much less considerable; the port of Batum, henceforth to be essentially commercial, Kars and Ardahan, with a portion of Armenia, were ceded to Russia, and Khotour, e. of lake Van, to Persia; the porte engaging to carry out at once much-needed administrative reforms in Armenia and elsewhere. By the "conditional convention," made in 1878, between Turkey and the United Kingdom, the English government undertook to defend the porte's dominions in Asia, and received in return the right to occupy and administer Cyprus. The rectification of the Greek frontier was not arranged till 1881. After endless negotiations and procrastination, which for a while seemed almost certain to lead to war, the porte agreed to cede, and Greece to accept, a considerable portion of territory, though less than the congress of Berlin had recommended. The new frontier gave to Greece all Thessaly, s. of the water-shed, forming the n. boundary of the valley of the Salambria (anc. *Peneus*), including the towns of Larissa and Trikhala; and in Epirus follows the line of the Arta river, leaving the town of Arta to Greece. The fortifications of Prevesa were to be destroyed by the Turks, and the Gulf of Arta was to be neutral.

During the years 1895, 1896, and 1897 the attention of the whole civilized world was drawn to Turkey in connection with the relations of the Porte to Armenia, Crete, and Greece.

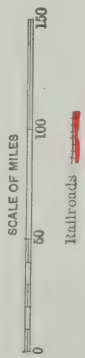
First.—The Armenian massacres. Reports as to the origin of the trouble in Armenia are conflicting, some placing the blame wholly upon the Porte, others accusing the Armenians of rebellious designs and of seeking to provoke the Turks to atrocities in order to draw upon the victims the sympathy of European powers and to make a general rising successful. In 1894 a war arose between the Armenians and the Kurds, and later in the year there was a series of massacres of the Armenian peasantry in the Sasun district. An attempt of Turkish officials to levy taxes upon the Armenians was repulsed and the authorities at Constantinople were given to understand that a serious insurrection had broken out. A force of regulars was thereupon dispatched to Sasun and, under the appearance of suppressing the revolt, committed numerous acts of cruelty. At the request of the European representatives, a commission of inquiry was appointed by the sultan to investigate the nature of the alleged atrocities. The European members of this commission, in their report, outlined a scheme of reforms which, however, the Porte hesitated to accept. In the meanwhile, the sultan appointed a separate commission to draw up an independent plan of reforms. The powers persisted in demanding the execution of the reforms proposed by their ambassadors and the Armenians also petitioned the Porte for a redress of grievances. Before the sultan had replied to the demands of the powers, conflicts took place between the Armenians and the Turks, and several hundreds of the former were massacred at Trebizond in October, and atrocities were committed by the Kurds at Diarbekr. The French, British and Russian ambassadors now renewed their demands of the sultan, who finally (Oct. 17th, 1895) announced his agreement to them. From inability, or through a deliberate purpose, the Porte failed to carry out these measures, and the foreign powers, at the instance of Great Britain, began to consider the advisability of adopting coercive measures. The Russians opposed this plan as contrary to the treaty of Paris and forbidden by implication in the treaty of Berlin. They favored a policy of delay, in the hope that the sultan would be able to set the administrative machinery in motion and improve the condition of the Armenians. The British government, finding that this view was held by some of the other European powers, reluctantly acquiesced. On an investigation by the embassies of the foreign powers at Constantinople, it was declared, early in 1896, that 25,000 Armenians had been massacred up to that time, not including those whose lives had been taken in massacres of which no official reports were procurable. In August, 1896, the Ottoman bank at Constantinople was seized by a party of Armenians, who threatened to blow it up, sacrificing their own lives along with the lives of the officials in the building, unless they were allowed to leave the country in safety. This outbreak on their part led to two days of rioting in the streets of Constantinople, which resulted in the slaughter of thousands of the Armenians. The sultan having consented reluctantly to the withdrawal of the insurgents in the Ottoman bank, they were secretly taken on board a vessel and shipped to Marseilles. The effects of this riot were the exportation, or massacre of fully one-half of the Armenian residents of Constantinople. The powers now protested to the Porte against the butcheries committed by the Turks in Constantinople and the protest was renewed in the following month. In October, 1896, the Porte finally yielded to the pressure of the powers and opened negotiations with the Armenian revolutionary committee. It was announced, in November, that the government was ready to introduce the promised reforms. In January, 1897, several remedial measures were put into effect, such as the appropriation of a sum for Armenian relief, the remission of some of the taxes, and the introduction of some administrative reforms. For several months there was a cessation of the outrages, but the suffering of the Armenian peasantry was intense. Some relief was afforded through the activity of the American Red Cross society, which, though at first refused permission by the sultan to enter his dominions, finally gained access to certain of the desolated districts. In 1896 and 1897 the importance of the Porte's relations with Crete and Greece drew attention away from the Armenian difficulty.



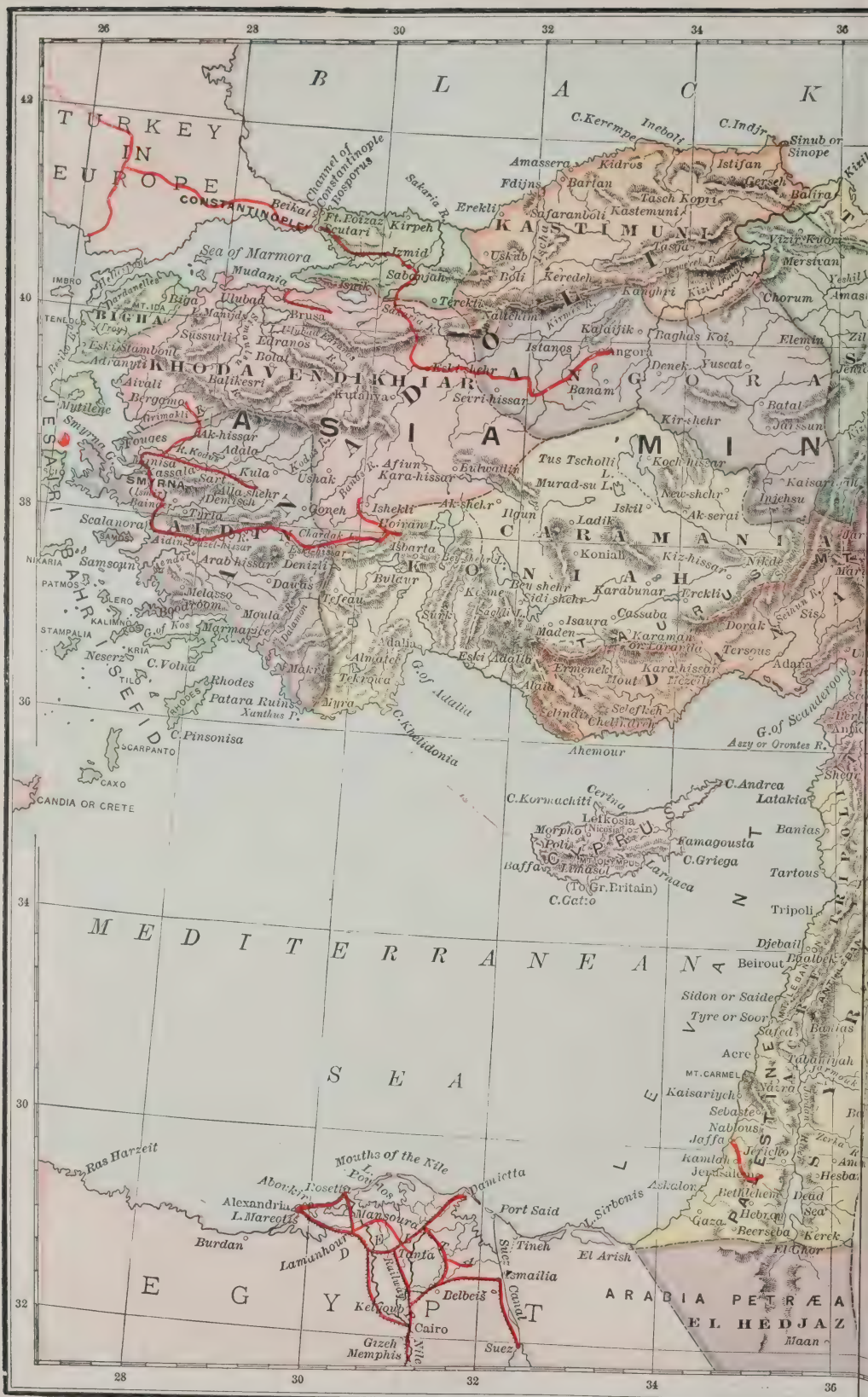


TURKEY IN EUROPE, GREECE,

ROUMANIA, SERBIA,
MONTENEGRO AND BULGARIA.



Longitude East 20 22 From Greenwich



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Railroads

D E S E

PAG 11 D-11

PERSIAN

42

Second:—Crete. As a result of the recommendations made by the Berlin congress, the Halepa pact was formed, granting Crete a fair measure of autonomy. This required the appointment of a Christian governor for five years, but the military governor still remained a Mohammedan. There were factional strifes among the islanders and affairs were for several years in confusion. Finally, after the elections of 1888, the defeated party took up arms, and bloodshed resulted. This led to the sending of a Turkish governor to the island with military authority, and to the withdrawal of the chief provisions of the Halepa pact in 1889. For several years the Christians submitted, but refused to go to the polls, and other things manifested marked discontent. In 1894 the Porte appointed a new governor, Karatheodory Pasha, a Christian, and the assembly met for the first time since 1889. The islanders now demanded reforms from the Turkish government and the feeling between the Moslems and the Christians ran high. In the spring of 1896 the Christian governor was recalled and a Mussulman sent in his place. The discontent now took the form of an open revolt. The powers intervened, and, desiring to secure peace until their representations had induced the Porte to grant reforms, proposed a pacific blockade of the island. This was resolutely opposed by Great Britain. The reforms which the powers pressed upon the Porte were finally accepted. They included the renewal of the pact of Halepa and the extension of some of its provisions. The governor was to be a Christian and the subordinate officials should consist, two-thirds of Christians and one-third of Mussulmans. Instead of the Porte's having a general claim on all the revenue, only a definite part was to go to it. Unfortunately, the carrying out of these reforms was delayed, and the Cretans, suspecting bad faith, again broke out in revolt. The difficulty was complicated by the fact that the Greek people, who had all along sympathized heartily with the Cretans, supplied them continually with money and arms. In February, 1897, the Greek government declared that ties of race and religion compelled it to intervene on behalf of the Cretans. An army of occupation was sent to Crete with orders to protect the Christian families and to restore peace. This action of Greece led to a protest from the Porte to the powers, and the latter resolved on a peaceful blockade of the island. The blockade went into force in March, 1897. When warned by the powers of the intended blockade, Greece replied with the suggestion of a compromise, but requested that the Cretans should be allowed to decide for themselves whether they preferred autonomy or union with Greece. With a strong feeling both in Crete and Greece in favor of union, it seemed probable that the latter power would persist, even at the risk of war. This proved to be so. Preparations for war were made by Turkey and Greece, and the troops were massed near the borders of Thessaly. In March the Crown Prince left Athens to take command of the Greek forces on the frontier.

Third:—War with Greece. For some of the details of the conflict between Turkey and Greece, see the article GREECE. The success of Turkey gave her a firm position in international affairs. The peace negotiations dragged on for some time, but, on Sept. 18, 1897, the preliminary treaty of peace was signed. Turkey demanded at first a considerable portion of Greek territory, as well as a large indemnity. The attitude of the powers was opposed to any violation of the integrity of Greece, but in regard to the indemnity, it was proposed that one or more of the foreign governments should assume control of the Greek financial administration, with a view to insuring the payment of the sum demanded by Turkey. Although the powers refused to admit Turkey's demand for a large accession of territory, they acquiesced in a so-called strategic rectification of the frontier between Turkey and Greece. This gave the victorious power control over many of the important strategic points, such as the mountain tops and passes which are capable of fortification along the line of the Thessalian frontier.

TURKEY IN EUROPE, generally hilly and undulating, is traversed by a mountain system which has its origin in the Alps, enters Turkey at the n.w. corner, and runs nearly parallel to the coast, under the names of the Dinaric Alps and Mt. Pindus, as far as the Greek frontier. This range sends numerous offshoots e. and w.; the great eastern offshoot being the Balkans (q.v.) range, with its numerous branches to n. and south. The rivers of Turkey are chiefly the tributaries of the Danube; the Maritza, Strumo, Vardar; the Narenta, Drin, and Voyutza. On the high lands, the cold is excessive in winter, and the heat of summer is almost insupportable in the western valleys. Violent climatic change is, on the whole, the rule in European Turkey; but those districts which are sheltered from the cold winds, as the Albanian valleys, enjoy a comparatively equable temperature. The wild animals are the wild boar, bear, wolf, wild dog, civet, chamois, wild ox.

TURKEY IN ASIA.—This portion of the Turkish empire is more hilly than the other, the two almost parallel ranges, Taurus and anti-Taurus, which are the basis of its mountain-system, cover almost the whole of the peninsula of Asia Minor or Anatolia (q.v.), with their ramifications and offshoots, forming the surface into elevated plateaux, deep valleys, and inclosed plains. From the Taurus chain, the Lebanon range proceeds southward parallel to the coast of Syria, and diminishing in elevation in Palestine, terminates on the Red sea coast at Sinai. Besides the Euphrates (q.v.), Tigris (q.v.), and Orontes (q.v.), the only important rivers of Turkey in Asia are the Kizil-Ermak, which rises on the borders of Cilicia, and after a devious course across the peninsula, falls into the Black sea, near Samsoun; the Meander and Sarabat, which flow to the Ægean; and the Sakaria, which empties itself into the Euxine. On the whole, Turkey in Asia is ill-supplied with water; and though the mountain slopes afford abundance of excellent

pasture, the plains, and many of the valleys, especially those of the Euphrates, Tigris, and Jordan, are reduced by the parching droughts of summer to the condition of sandy deserts. In ancient times, these now desert districts were preserved in a state of fertility by artificial irrigation; but during the six centuries of almost constant war which convulsed this once fair region, the canals were neglected, and have, ever since the rise of the Osmanli power, remained in an unserviceable condition. The fauna includes the lion (e. of the Euphrates), the hyena, lynx, panther, leopard, buffalo, wild boar, wild ass, bear, jackal, jerboa, and many others; and the camel and dromedary increase the ordinary list of domestic animals. In Africa, Tripoli and Egypt are still tributary. See TUNIS.

Industries, Manufactures, and Trade.—Owing to the natural fertility of the soil, the land yields sufficient materials for the comparatively unimportant manufactures of the country, despite the primitive methods employed in agriculture. The unsettled conditions have checked the development of industry. There is a lack of enterprise among the natives, and foreign capital is kept away by the insecurity of investments. The delays and uncertainties in the administration of justice and the prejudice against foreigners make Turkey an unattractive field for the western investor. The factories are few in number. In Constantinople there are factories for boots and shoes, cotton cloth and felt hats and caps, all owned by the government, as well as a few establishments belonging to private persons, including manufactures of ice, glass, beer, paper, cotton yarn, and tobacco. In 1896 a considerable decrease was reported both in the industries and in the foreign trade, owing to the political disturbances outlined in a preceding paragraph; but exact statistics could not be obtained. Many of the principal products of Turkey find a market in the United States, especially carpets, rugs, opium, mohair, attar of roses and wool. Other exports are gum tragacanth, nuts, paper, canary seed, millet, skins, tobacco, raw silk, and iron ore. The chief trade of Turkey is with Great Britain, France, Austria, Russia, Bulgaria, Persia, Italy, Roumania and Egypt. In 1892-93 the exports amounted to 1,557,204,200 piasters, and the imports to 2,446,698,542 piasters, the piaster being equivalent to 4.4 cents in United States currency. Internal and coastwise trade suffers from the inadequate transportation facilities, but some improvements have been made in this respect, such as the construction of new quays at Constantinople and the building of new railway lines both in European and Asiatic Turkey. In 1896 there were 2423 miles of railway open for traffic. Communication with the United States is by steamers from Constantinople to Liverpool, Marseilles, Hamburg, Havre and Genoa, at which ports the goods are transferred to vessels bound for the United States.

Administration, Religion, Education.—The government of Turkey has always been a pure despotism, the constitutional reforms proclaimed in 1856 and 1876 not having been carried out. The power of the sultan is absolute, provided it is in conformity with the recognized principles of the Mohammedan religion as laid down in the Koran. Under his supreme direction there is the Sheik-ul-Islam, who is the head of the church and the chief of the Ulema (q. v.), a body of theologians, jurists and teachers. At the head of the civil administration, under the sultan, is the Grand Vizier who is aided by a privy council, termed the Medjliss-i-Hass. The empire is divided into 31 governments, called vilayets, which, in turn, are subdivided into sanjaks, or provinces. At the head of each vilayet is a vali, or governor-general, who is assisted by the provincial council, and at the head of the sanjaks are subordinate officers. The prevailing religion is Mohammedanism. According to the latest figures available in 1896, the Ottoman empire, as defined by the treaty of Berlin, contained 16,000,000 Mohammedans and 5,000,000 Christians. These estimates do not include the Arabian and African provinces, which were thought to contain about 7,000,000 Mohammedans. The Mohammedan population is unequally distributed throughout the empire, comprising the great majority of inhabitants in Asiatic Turkey, but only about one-half of those in European Turkey. Nominally the non-Mohammedans enjoy toleration, being recognized by the government, and having the right of possessing their own ecclesiastical organizations. There are seven non-Mohammedan sects thus recognized, namely the Roman Catholics, the Greeks, Armenians, Maronites, Syrians and United Chaldeans, Protestants, and Jews. Education is in a backward condition, although, since 1847, some efforts have been made to promote it. There are public schools in most of the Turkish towns, and colleges for secondary education in connection with the chief mosques.

Revenue and Debt.—Turkey has been under a sort of financial tutelage since 1881, when a council of administration, representing the interests of the foreign bondholders, was formed at Constantinople. Down to that time there was great uncertainty in regard to the actual revenue and expenditure of the Turkish government. Estimates were given, but the budgets were so framed as either to show a surplus or to make the income and disbursements balance each other, while it was notorious that there were heavy deficits year by year. Years before the war of 1877, the Turkish exchequer was evidently on the brink of insolvency, and the effect of that war was greatly to add to the indebtedness. It virtually declared itself bankrupt and, in 1881, permitted the appointment of the above mentioned council of administration for the benefit of its creditors. In 1895-96 the net revenue collected by the council was £1,942,852. The loans outstanding in 1896 amounted to £131,514,124. For some account of the military and naval forces of Turkey, see the articles ARMIES, MODERN and NAVIES, MODERN. The history of Turkey down to the Congress of Berlin is given under OTTOMAN EMPIRE.

TURKEY BUZZARD. See **VULTURE.**

TURKEY-RED. This celebrated color—the most durable, and perhaps one of the most beautiful which has yet been produced on cotton—is dyed by a process supposed to have been practiced in India from immemorial time. It passed from thence through other parts of Asia to the countries of the Levant, and was introduced into France about the middle of last century. The first successful attempt to introduce it into Great Britain was made in Glasgow in 1783, by a Rouen dyer named Papillon, in conjunction with Mr. George Macintosh, the father of the inventor of waterproof cloth. They established the celebrated Turkey-red business now carried on by Messrs. Henry Monteth & Co. By an agreement with the trustees for manufactures in Scotland, Papillon allowed them to make his process public in 1803; and since then, Turkey-red dyeing has been extensively carried on in Glasgow and its neighborhood, and also in Lancashire.

There is a mode of dyeing cotton red with madder practiced by calico-printers—the cloth being previously bleached with chloride of lime—where the whole process only occupies a day or two. But in the case of Turkey-red, which is also a madder-dye, the operations are long and tedious, and the bleaching with chloride of lime especially objectionable. The following is an outline of the steps in the Turkey-red process, as usually conducted: 1. Unbleached calico is thoroughly washed at a dash-wheel or other washing-machine, and then boiled for some time in a solution of carbonate of soda. 2. The cloth is soaked in a bath containing a soapy emulsion of olive oil, sheep's dung, carbonate of soda, and water; and allowed to remain for a week or more impregnated with the solution, after which it is aired in the field, and dried in stoves. This operation is repeated at least three times. 3. The next stage, sometimes called "liquoring," consists in passing the cloth through an emulsion of olive oil and carbonate of soda, but without sheep's dung; after which it is aired in the field, and dried in stoves, as in the last operation. The "liquoring" is repeated at least four times. 4. The cloth now requires to be soaked in a weak alkaline lye of pearl-ash and soda, in order to remove any excess of oil. 5. The cloth is warmed in a bath containing a mixture of powdered oak-galls and sumac, or either of these substances alone, the operation being sometimes called "galling," and sometimes "sumaching." 6. The cloth is next steeped for twelve hours in a solution of alum, partially neutralized by carbonate of soda, but sometimes acetate of alumina is used instead of alum. Without this treatment, the dye could not be fixed upon the cotton. See **DYEING**. 7. When thoroughly washed, the cloth is ready to receive the red dye, which is produced by immersing it in a decoction of madder, to which some chalk and bullock's blood are sometimes added. It is put into the dye-beck when cold, and kept in it for two hours after it has been raised to the boiling-point. 8. It is next boiled in a weak solution of soap and soda, which removes a brown coloring matter present in the madder-dye, but more fugitive than the red portion. 9. Finally, the dyed cloth is cleared or brightened by boiling it in a solution of chloride of tin, and then washing and drying it. A more recent plan is to employ chloride of lime for the clearing.

The theory of Turkey-red dyeing is not well understood, which so far accounts for the fact that it has been found impossible materially to shorten the process. The three most essential operations are the oiling, or rather the impregnation with an oleaginous soap, the mordanting with alumina, and the dyeing with madder; but it is found that if any of the numerous dippings in the oily emulsions are left out, the color is inferior in proportion to the number of omissions. This is the least understood part of the process, and is no doubt the cause of the rich appearance of the dye, which approaches some of the fine reds produced on wool.

Besides being largely used in its plain state, Turkey-red cloth is extensively employed for handkerchiefs with white patterns produced upon them by discharging the color (see **BANDANA**); and of late years articles of various kinds, with patterns in several colors, have been produced by ordinary calico-printing machines, where, by proper arrangements, the different colors are obtained on parts where the red color is discharged by chloride of lime.

TURKEY-STONE. See **HONES.**

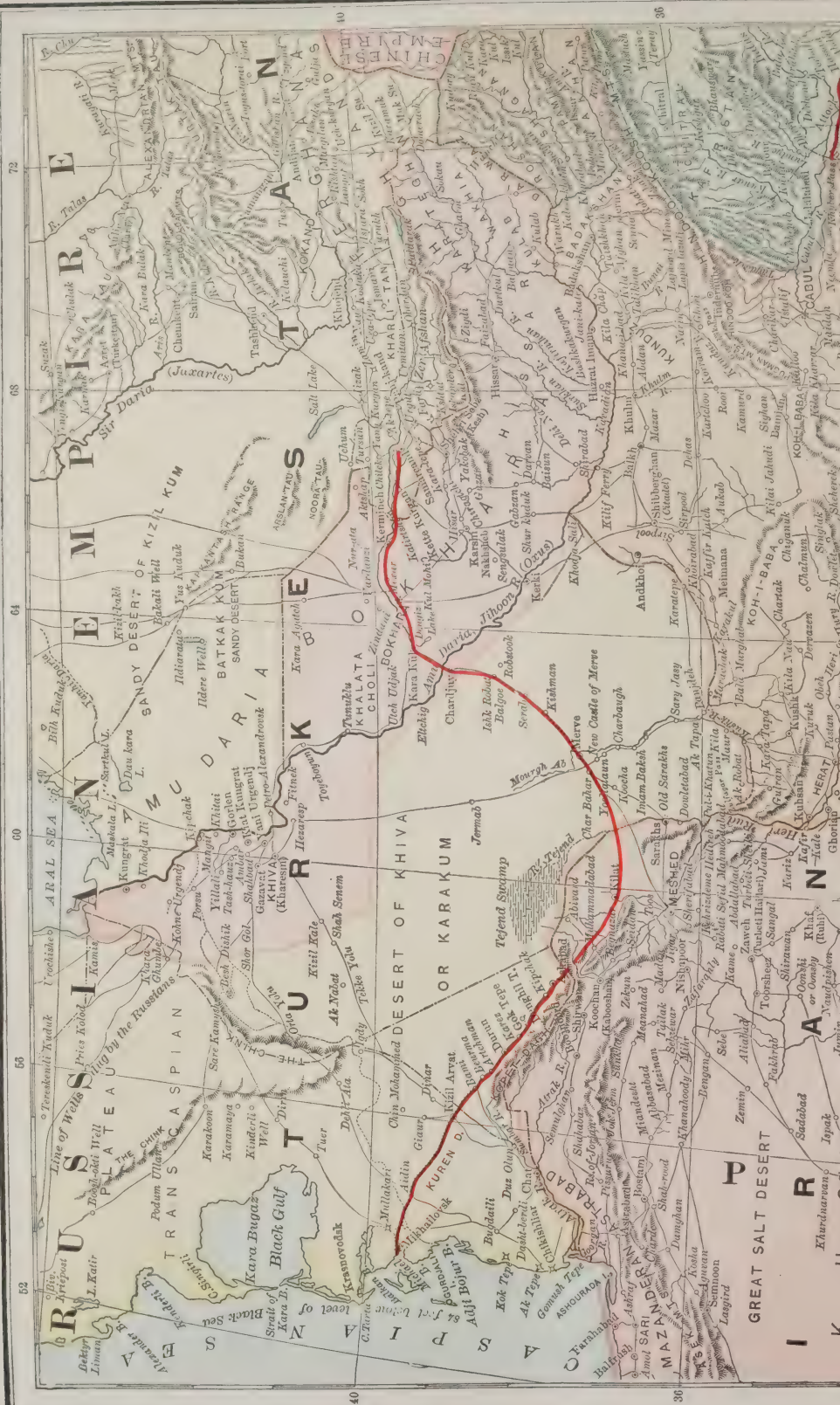
TURKISH LANGUAGE AND LITERATURE. The Turkish is one of the Turanian (q.v.) idioms, and is chiefly divided into eastern and western Turkish. The former is mainly represented by the Uigur (Jagatai), an idiom but recently recognized not only to belong to the Turkic stock, but to be its most ancient representative. Its forms are fuller and more pure, albeit, to a certain extent, harder and rougher. Its alphabet is formed from the Zabian, out of which have sprung also the Mongol and Mantshu. Besides this, the Kiptchak, spoken in Kasan and Astrakhan, forms a principal branch of the eastern Turkish, for which, however, but little has hitherto been done from a philological point of view.

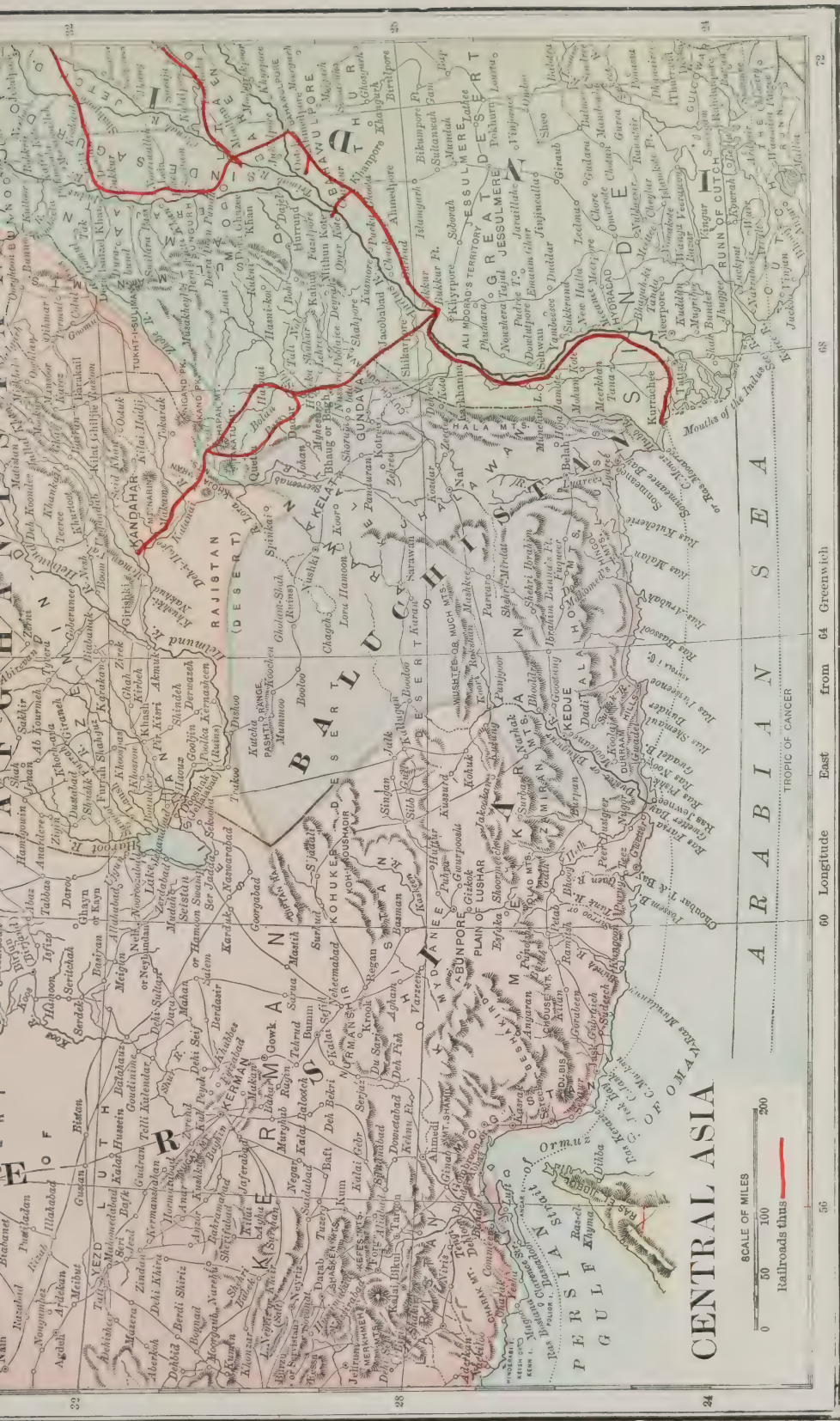
Of infinitely higher importance, however, is the western Turkish, or language of the Osmanlis, which, through the conquests of that race, has spread far and wide over the whole of western Asia, the Levant, and parts of Europe. The Osman or western Turkish (emphatically Turkish) is more melodious and soft than the former, and so much

mixed with foreign elements, chiefly Arabic and Persian, that, were it not for its grammar, which is purely Tartarian, it could hardly be called an original language, but rather a conglomeration of the three respective idioms. Besides, it has also received a large increase of words from other Asiatic and European languages, e.g., the Chinese, Greek, and Italian. It is one of the most widely spoken idioms; not only western Asia, but even the e. of Europe, use this tongue to a great extent for commercial and political transactions. The characters in which it is now written are no longer the original Uigur letters, but the Arabic, the 28 characters of which have been increased by the four additional Persian characters—produced by further diacritical points, and a new one of their own, amounting in all to 33, which are written from right to left, as is the case in all (save one) Semitic languages. But this alphabet is not well suited to a language composed, like this, of elements belonging to the three great families of speech, viz. Semitic, Indo-European, and Turanic. Neither the vowels nor the consonants are adequately represented in all cases. Occasionally, however, it is also written in Armenian characters, which renders its sounds much more faithfully. There is no definite article or gender. The plural is indicated by a final *lar* or *ler*, and the cases are formed by the addition of *ung*, *eh*, *i*, *den*, and *le* for gen., dat., accus., abl., and instrumental respectively; which are, in plural, affixed to the *ler* or *lar*. The adjective has no flexion, but is placed unchanged after the noun. Diminutives are formed, somewhat like in Italian, by suffixes. The comparative and superlative are formed by circumlocution. The personal pronouns are without gender, and their declension is like that of the nouns. The possessive pronouns are made by suffixes. The Turkish verb is of a very complex nature. There are seven *genera* (active, passive, negative, impossible, causal, reciprocal, reflexive), all of which are formed by certain monosyllables affixed or prefixed. The root of the verb is the second person singular imperative, to which the infinitive affix *mak* or *mek* is joined. The moods and tenses are formed chiefly by the addition of the respective forms of the auxiliary verb *olmak*, to be. Apart from this, there are special particles to express the optative, conjunctive, etc. Conjunctions are either formed by gerundives or possessive forms, or they are borrowed from Persian and Arabic. Adverbs are formed by certain suffixes. The Turkish construction is most peculiar; the genitive always precedes the nominative, and the verb always stands at the end. All this gives the Turkish style a peculiarly artificial and inverted appearance, and often a sentence cannot be in the least comprehended until it is quite finished. Oriental flourishes, and allegorical figures of speech, with which Turkish is very lavish, do not tend to facilitate the study of the language.

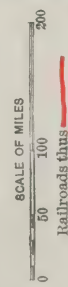
The original literature of Turkey is to be found in the scanty remains of the Uigur period. That remote eastern branch of the Turkish family had, after their emigration from their homes, s. of the lake Baikal, to the Tangnu Tagh, played a foremost part in the contests and migrations of Central Asia, until they disappeared in the Mongol empire about 1200 A.D. They were acquainted with Chinese literature, and had adopted the Buddhist doctrines to a certain extent, and their scanty literary relics bear traces of these influences. When, however, the Turks, in the 11th c., began their conquest of the countries of Mohammedan Asia, they learned to appreciate the literature of Persia, then beginning to grow up in its full glory; and ever since, Turkish literature and Turkish language have retained a strong Persian impression. Two branches of Turkish literature are usually distinguished—first, the Eastern or Jagataian, which chiefly flourished between Timur's and Baber's time (1400–1530). Mir Ali Shir, the vizier of sultan Hussein, is the most renowned poet of this period. He also collected the most ancient Jagatai poems. Sultan Baber, also belonging to this epoch, wrote memoirs of his life and time (translated into English), which are of considerable importance. The other or Turkish literature, principally so called, is exceedingly rich, but hardly deserving the name of an original literature, it being for the greatest part, a mere imitation of Persian and Arabic models. Of early writers, deserve special mention Sheikhi, a romantic poet and physician, and Soleyman Tchelebi. In the 16th c., the most flourishing period of Turkey, we find Meshihi, the poet; Kemal Pasha Zadeh, the historian and jurist. In history, we have, besides annalists like Saad-ed-Din, historians like Mohammed Effendi. Of the same epoch is Lamii, who excelled in many branches of literature, besides being an accomplished translator of Persian poets. Fasli (d. 1563) and Baki, the chief of Turkish poets (d. 1600) conclude this period, which is followed by another of great activity, but of inferior rank. It boasts of Nebi, the poet; Nefi, the satirist; but above all, Hadji Khalifah (q.v.), the eminent historian, geographer, and encyclopædist. Raghib Pasha stands out in the 18th c., together with Said Rufet Effendi, and a number of smaller writers. Little is to be told of the present stage of Turkish literature; but there is a great activity now visible in the province of educational works, and the reproduction of ancient writings; a feature which augurs well for the future. David's (Lond. 1836), Redhouse's (Par. 1846), and Kasem-Beg's (Kasan, 1845; Ger. by Zenker, 1847) are the best known Turkish grammars; and Kieffer and Bianchi's (*Dictionnaire Turc-Française*, 2 vols., Par. 1835), as well as Redhouse's and Zenker's, among the best dictionaries. See Redhouse's *History of T. Poetry* (1879); Gibb's *Ottoman Poems* (1882).

TURKISTAN', "the country of the Turks," called also *Jagatai*, and by the Persians *Turan*, is an extensive region of Central Asia, stretching from the Caspian sea eastward





CENTRAL ASIA



60 Longitude East from 04 Greenwich

72

68

56

to beyond Lob-nor (long. 110° e.), and from Siberia and Dzungaria southward to Persia Afghanistan, and Thibet. Until quite recently, it was supposed that the Bolor Tagh (q. v.), a mountain chain of the first magnitude, running n. and s., divided it into two parts. English explorers entering Turkistan from the s., and Russians from the n., have shown that no such range exists. Its place is taken so far, however, by a lofty table-land, the Pamir Steppe, which, sloping gently toward the e. and w., separates the rivers running eastward to the desert of Gobi from those which run to the sea of Aral. It separates Turkistan into a western and eastern portion.

WESTERN TURKISTAN, *Great Bukharia*, or simply *Turkistan*, or *Turan*, consists of the great hollow plain of the Caspian and Aral seas, which occupies its w. and center, and of the hilly and well-watered districts formed by the ramifications of the Thian-shan mountains and Hindu Kush. The plain is composed of deserts of loose shifting sand, interspersed with oases where a subsoil of clay renders the formation of lakelets of rain possible; strips of fertile land along the banks of rivers, and occasional tracts clad with coarse thin grass; the eastern districts abound in valleys of remarkable fertility. The climate varies on the plains from extreme cold to burning heat, and though, in the eastern highlands, the cold is almost as intense in winter, the heat of summer is much less. The rivers of Turkistan are the Sir-Daria (see JAXARTES) and Amu-Daria (see OXUS); the Zer-Afshan, which rises on the s. of the Asfera-tag, and flows westward for 400 m., terminating in a small salt lake or marsh near Bokhara; and the Murghab, which rises in the mountains of Ghur, and after a w.n.w. course of 450 m., loses itself in a marsh beyond Merv. The vegetable products of the country include fruits, grain, cotton, flax, hemp, and tobacco. Forests can hardly be said to be at all represented in this extensive region. Salt is abundant, large tracts of desert being strongly impregnated with it; and sal ammoniac is common. Agriculture and the breeding of the domestic animals are the occupations of the great mass of the population; but manufacturing industry is also considerable, including cotton, silk, linen, and woolen goods, shagreen (superior to that manufactured in Europe) and other kinds of leather, paper made of raw silk, carpets, and a few sabers, knives and rifles.

Western T. is divided into Khokan (q. v.), now the Russian province of Ferghana, in the n.e.; Khiva (q. v.), part of which is now Russian territory, in the w.; Bokhara (q. v.) in the e. and center; Kunduz or Badakshan (q. v.) and Balkh (q. v.) in the s.e.; and the tracts lying n. of the Persian frontier. The population of Western Turkistan, estimated at 4,000,000, consists of various races, the Usbegs (q. v.) or Uzbeks, the dominant race, Turkomans, Karakalpaks, Kirghis (q. v.), Sarts or Tajiks, Persians, Kiptchaks, and a few Arabs, Hindus, and Jews. Of these the Sarts or Tajiks, the original inhabitants of the cities, are of ancient Persian stock, and along with the Uzbeks, Hindus, and Jews form the settled population; the Persians are either slaves, or, being introduced into Turkistan as such, have obtained their freedom, and settled in the country; the other races are mostly nomad and predatory. The prevalent religion is Mohammedanism, and most of the tribes are Sunnites. A few Sheeahs, Sufis and Buddhists are also found.

Turkistan has played an important part in Asiatic history from the very earliest times. The earliest light of history shows us Bactriana (Balkh) and Sogdiana (Bokhara) as well-cultivated and populous countries, inhabited by Persians, to whom most of the prominent cities of Turkistan owe their origin. With Persia, Turkistan passed into the hands of the Macedonians, who made Bactria an independent Greek kingdom, while the rest was in possession of the Parthians. Under the Sassanides, the Persian boundary was again advanced to the Jaxartes; but the gradual gathering of Turkish tribes from the n.e. on the right bank of that river, led to a constant state of warfare on the frontier, which ultimately resulted in the occupation of *Maver-ul-neher* ("the country between the rivers"—i.e., the Oxus and Jaxartes) and of Khaurezm (Khiva) by the invaders. In the 8th c. of the Christian era, the Arabs possessed themselves of Turkistan, and during the decline of the caliphate, it became the seat of various minor dynasties, as the Samani (q. v.) in Mawer-ul-neher, and the shahs of Khaurezm; and after a brief union with the Seljuk empire in Persia, was mostly united to Khaurezm, and along with it overrun by the Mongol hordes under Genghis Khan (q. v.), on whose death it became one of the four divisions of his vast empire, and was allotted to his son Jagatai. On the decline of Jagatai's dynasty, Timûr (q. v.) rose to supreme authority in Turkistan, and in the course of a 35 years' reign, made it the center of an immense empire, which stretched from the Hellespont to the frontiers of China, and from Moscow to the Ganges. This period was the golden age of Turkistan; its powerful monarch was never weary of adorning its cities with the spoils of victory; colonies of learned men, skilled artisans, and all whose knowledge or abilities could be of service to his subjects, were either transferred to Turkistan from the countries he had conquered, or induced by the most munificent offers to settle there; till under him and his more immediate successors, Samarkand became a focus of enlightenment and learning. But after the death of shah Rokh, Timûr's youngest son, the empire was split up into numerous fragments; and after a time a new dynasty snatched Persia from Timûr's family, while the Uzbeks, under Sheibani Khan, drove them (1500) from the country n. of the Amu-Daria; one of the expelled princes, Mirza Baber, who had ruled in Ferghana (the s. half of Khokan), subsequently founding the "Great Mogul" empire in Hindustan. The Uzbek empire generally included Badakshan, Herat, and Meshed; but these were

lost on its division in 1658 into various independent khanates. Khiva was conquered by Nadir Shah in 1740, and Bokhara limited to the n. bank of the Amu-Daria; but the Kirghis of the Little Horde restored the independence of Khiva, which they ruled till 1792, when the present Uzbek dynasty obtained the throne; and shah Murad (1806-22), celebrated under the appellation of *Beggee Jan*, effectually re-established its former extensive sway to the Bokhariot scepter. Khokan, after emancipating itself from the authority of Sheibani's successors, was incorporated with Bokhara; but afterward united with the states of eastern Turkistan; and on their conquest by China, resumed its independence. The recent history of Turkistan records a series of wars between Bokhara and Khokan, and Bokhara and Khiva, in which the Bokhariots had generally the advantage, owing to the aid of the Turkomans of the southern desert, whom they subsidize; the raids of the Turkomans along the northern frontier of Persia; the advance of the Afghans from the s.e.; and the progress of Russian conquest from the n. and west. To explain the Turkoman raids, a few additional words on the geography of Turkistan are necessary. Between the deserts of Turkistan and those of Persia lies a long and fertile tract running from the s.e. of the Caspian to Herat, the "key to India;" over it pass the great routes from western to eastern Asia. North of it, chiefly in the deserts, dwell the Turkomans, a population of savage brigands and man-stealers, constantly engaged in marauding expeditions against the northern Persians. They have desolated the frontier, and the atrocities they commit far exceed anything recorded of the African slave-trade. In 1860, Hanza Mirza, an uncle of the present shah, marched against them, but was defeated in attempting to capture their intrenchments in a marsh. On that occasion, 15,000 Persians and 30 guns were taken by the Turkomans. In 1865 a more successful expedition proceeded against Saraks, and the guns were recovered. Still the northern routes are in the hands of the Turkomans, more especially that leading by the Daman-i-koh hills; and, so late as 1872, reports appeared of Turkoman raids in northern Persia. The south-eastern part of Turkistan has also been the scene of recent strife. The Afghans have invaded it for the recovery of possessions they claimed n. of the Hindu-Kush. In 1850 they took Balkh and Khulm, and in 1859, Kunduz, Badakshan, at the same time submitting to pay a large tribute. The English and Russian governments seem now to recognize the claim of the Afghans to fix their frontier at the Oxus (see debate in house of commons, April 22, 1873). In 1884 they invaded Khokan, and took Tashkend and Khokan. A struggle followed with Bokhara. On May 20, 1866, was fought the battle of Irjar, the most important event in the recent history of Turkistan. The emir had to flee for his life, leaving his camp in the hands of the enemy. In 1868, the Russians, 8000 men, again advanced and crossed the river of Samarkand. The troops of the emir, 40,000 men, took to flight when they saw the Russians approach with their dreaded artillery, and on June 14 a treaty was concluded, by which Bokhara transferred to Russia, Samarkand and all the territory n. and e. of it. Khiva still remained independent in the midst of its deserts. But early in 1873 an expedition in four divisions set out from the Russian frontier posts against Khiva, which fell in June of that year, after no great resistance. A great part of Khivan territory n. of the Amu-Daria was ceded to the conquerors; and after a fierce struggle in 1875 and 1876 with the warlike inhabitants of Khokan, which is now the Russian province of Ferghana, Russia formally annexed the whole. The news of the fall of Khiva was welcomed in Great Britain as a triumph of civilization over barbarism; but the further annexation of Khokan provoked the fear that Russia would go on to annex other territories then in the hands of the Turkomans, including the northern routes to Herat; that she would convert the Turkomans into a great army of horsemen, under European officers, the most formidable in the world, and prepare for further conquests. The oasis of Merv was annexed in 1883, and with the subsequent submission of the Sarik tribe to the south, the conquest was complete.

EASTERN TURKISTAN, known also as *Upper Tartary*, *Chinese Turkistan*, *Little Bokhara*, and *Tarfan*, is bounded on the n. by the Thian-shan mountains, on the w. by the Pamir table-land, and on the s. by the highlands of Thibet or Cashmere. Toward the e. it sinks to the desert plain of the Gobi, round the western bay of which it forms a vast crescent-shaped oasis from 4000 to 5000 ft. in elevation, drained by the tributaries of the Tarim. This river flows eastward into the desert, and empties itself, after a course of 1500 miles, into the Lob-nor, a lake, or rather series of lakes and marshes. The region around it is very desolate and unattractive. The country produces gold and abundance of silk; and the inhabitants are skillful in making gold and silver stuffs, carpets, and linen, cotton, and silk goods. Silver, copper, lead, and iron ore are abundant, but are not mined to any extent. The political capital is Kashgar; the commercial capital, Yarkand. In the latter are numerous colleges and schools; in both there used to be an active trade, with resident representatives of most of the nations of Asia. But since the reconquest of the country by China, anarchy prevails, and trade is, for the time being, destroyed; all the more as Kuldja, taken by the Russians from the rebels against Chinese authority in 1871, has been retained by Russia, in spite of Chinese protestations. In 1879, however, it was understood that Kuldja was to be restored to China. The inhabitants speak Turkish, but are said to be of Persian descent. Little is known of eastern Turkistan previous to its conquest by Genghis Khan; but after the decay of his empire into petty states, among which are Kashgar, Yarkand, Aksu, and Khoten, the chiefs of these were constantly quarreling with each other — a temporary peace being occasionally produced by their subjection to some powerful neighbor — till several of the leaders, with the Yarkand prince at their head, invited the Chinese to take possession of the country, and in

1758 it became a province of China. In 1864, however, a mutiny among the Chinese troops induced the dispossessed native chiefs to stir up a Mohammedan insurrection. They invited a Khokan prince, Buzurg Khan, to assume the government. Through his lieutenant, Yakooob Beg, he dispersed the Chinese garrison left to defend the fort of Kashgar. But the lieutenant soon superseded him, and became sole emir, under the title of Athalik Ghazi. He possessed civil as well as military capacity, and raised the country to a state of considerable prosperity. He sent an envoy to Calcutta in 1872, and in 1873 Sir T. D. Forsyth visited Kashgar from the Indian government. But the emir's position did not secure more intimate relations. He had since 1869 successfully resisted the encroachments of Russia, but in 1876 the Chinese again advanced, defeated him, and retook their old province in 1877. The emir died shortly after. See *illus.*, *ETHNOLOGY*, Vol. V.

TURKS, the name of a numerous, important, and widely-spread family of the human race, members of which are to be found as well on the banks of the Lena in Siberia, as on those of the Danube and the shores of the Adriatic in Europe. The Turks belong to the second of Blumenbach's five great divisions of mankind—viz., *Mongolians*; and to the first, or *Mongolidae*, in Dr. Latham's threefold classification. In this latter classification, the Turks form a branch of the Turanian stock of Altaic Mongolidae. Their geographical distribution, according to Dr. Latham, is as follows: "1. As a continuous population. East and w.; from the neighborhood of the lake Baikal, 110° e. long., to the eastern boundaries of the Greek and Slavonic countries of Europe, about 21° e. long. N. and s.; from the northern frontiers of Thibet and Persia, about 34° n. lat., to the country n. of Tobolsk, about 59° n. lat. 2. As an isolated population. Along the lower course of the Lena, and the shores of the White sea, chiefly within the Arctic circle. 3. As portions of a mixed population in China, Thibet, Mongolia, Persia, Armenia, the Caucasian countries, Syria, Egypt, Barbary, Greece, Albania, and the Slavonic portion of Turkey in Europe." The names *Tourkoi*, *Turkai*, and *Turcæ* occur in some ancient authors as applied to a Scythian people dwelling in Asiatic Sarmatia, and it is very likely that the Scythians of antiquity were allied in blood with the numerous existing Turkish tribes, if not absolutely their ancestors. The original seat of the Turks was probably upon the northern slopes of the Altai range, from which, while a portion emigrated into independent Turkistan, others going s.s.e., established themselves upon the confines of the Chinese empire. MM. Abel-Rémusat, Klaproth, Ritter, and other high authorities concur in tracing all the now existing Turkish tribes to the Hiong-nu, a powerful nation who, prior to the Christian era, threatened to overrun and subjugate China, and who then occupied the whole of the vast region now called Mongolia, from the n. of China to mount Altai. Dr. Prichard coincides in this opinion. The Hiong-nu (or *vile slaves*, so called by the Chinese), indeed, for some time succeeded in establishing a kind of rule in China, and even intermarried with the imperial family; but about the commencement of the Christian era, their power in China began to wane, and before the end of the 2d c. they were driven back as far as independent Turkistan. "After the fall of the empire of Hiong-nu," says Prichard, the Turks "are known in Chinese history by the name of *Thu-k'iu*, or *Turks*, and *Whey-ou-eul*, by Europeans written *Huy-hurs*, and more correctly, *Uigours*. The *Uigours*, or eastern *Turks*, whose history has been elucidated by Abel-Rémusat, are the link of connection between these more remote nations and the Seljuki and Osmanli *Turks*, who are known to European historians."

After the fall of the Hiong-nu empire in China, the tribes who composed its strength separated, some maintaining themselves in their acquired settlements, and even conquering portions of China; but by far the greater number spread westward over western Mongolia, e. and w. Turkistan, and southern Siberia, and gradually lost their power and unity as a nation. Out of this *débris* of a fallen people arose, in the 5th c., the great empire (the empire of Kiptchak) of the *Thu-k'iu*, which contested the supremacy of central Asia with the Chinese on the e., and the Sassanidae (q.v.) on the w., ultimately falling in 744 before the *Hoei-he*, a confederation of Turkish tribes which had hitherto been subject to it. The *Hoei-he*, attacked in the w. by the *Hakas* (the ancestors of the present Kirghis), yielded to their assailants in 848, but retained their power e. of the *Bolor-tagh*, and for 150 years longer ruled supreme from that range to the *Hoang-ho*. During the eight centuries succeeding their expulsion from China, a regular though slow progress westward had been maintained by some of the Turkish tribes, a portion of whom appear (5th c. A.D.) in southern Russia, and on the northern frontier of the Byzantine empire, driving before them the kindred race of the *Avars*. They were found in Syria and Mesopotamia in the 7th c., and about the same time wandered into northern and eastern Khorassan. But the seat of power of the Turkish race still was in central Asia, whence in the 10th c. the *Seljuks* (q.v.) emerged, conquering Persia, Syria, and Asia Minor, and establishing an empire which reached from Constantinople to the borders of Mongolia. The subdivision of the Seljuk empire in south-western Asia led to its gradual absorption by the *Khaurezmians* in the n., and the *Kurds* in the w., till the irresistible tide of Mongol invasion under Genghis Khan (q.v.), rolling over central and western Asia, and the e. of Europe, completely overwhelmed Turkish dominancy. The great empire of Timur (q.v.) was Turk, with a strong infusion of the Mongol element, the residue of Genghis's irruption; and its destroyers, the *Usbegs* (q.v.), and the various other tribes—*Kirghis*, *Kiptchaks*, *Turkomans*, etc.—which now possess its

extensive domains, are also of Turkish race. The Osmanli-Turks are descended from a portion of the Turkish tribe of the Kayi, which fled from its settlements in Khorassan before the Mongols, and took refuge with the Seljuks of Iconium. See OTTOMAN EMPIRE, SELJUKS, etc.

The following is the enumeration of the principal Turkish tribes given by Dr. La-tham: "1. *Uigurs*.—On the Mongol frontier. Belonging to China. The Uigurs were the first Turks that used an alphabet. Little known. 2. *Turks of the Sandy Desert*.—Conterminous with Mongolia and Thibet. 3. *Turks of Khoten, Kashgar, and Yarkend*. 4. *Kirghis*.—Independent Tartary. The Kirghis (q.v.) form a portion of the population of the highest table-land in Asia—perhaps in the world—Pamir and the source of the Oxus. 5. *Usbegs* (q.v.).—The Turks of Bokhara. 6. *Turkomans*.—The Persian frontier of Independent Tartary from Balkh to the Caspian. Pastoral robbers. 7. *Ottoman or Osmanli*.—The Turks of the Turkish empire. 8. *Nogays*.—The Turks of the parts between the Black sea and the Caspian, n. of Caucasus. 9. *Turks of the Russian Empire*.—Bashkirs, Teptyars, Baraba, etc. With all these, although the language is Turk, there is good reason to believe that the original substratum is Finn. With the Bashkirs, this is generally considered to be the case. 10. *The isolated Yakuts of the Lena*."

In physical appearance, all these tribes, with the exception of the Ottoman Turks, partake more or less of the Mongolian type. They have in general a broad, flat face, with prominent cheek-bones, the head from side to side nearly equal to its length from the forehead to the occiput, the nose flat, the eyes small, the color of the skin yellowish, straight hair, little or no beard, and stature undersized. It is among the nomad and agricultural Turks that these characteristics are most prevalent, while among the more civilized they almost entirely disappear. Dr. Prichard quotes lieut. Wood's account of the Kirghis as a good average description of the primitive Turkish tribes. "In stature," he says, "the Kirghis are under the middle height; of a *kyl* numbering seven men, the tallest was 5 ft. 5½ in. in height. Their countenance is disagreeable; the upper part of the nose sinks into the face, leaving the space between their deeply-seated and elongated eyes without the usual dividing ridge; the brow immediately above the eye is protuberant, but starts back more abruptly than in Europeans; their cheeks, large and bloated, look as if pieces of flesh had been daubed upon them; a slender beard covers their chin; and in those individuals who have more luxuriant hair, the beard has a natural curl. Their persons are not muscular. Their complexions are darkened by exposure to all weathers rather than by the sun. The women are rather good-looking, and of delicate form, like the Hazaras, and make good wives." The Turks of the Turkish empire, especially those of the upper classes, differ considerably from the type here described. The Ottoman Turks, in fact, both in feature, height, and general physical structure, bear a strong resemblance to other European nations. This is accounted for chiefly by the custom now prevalent among them for ages of intermarrying with Circassian females.

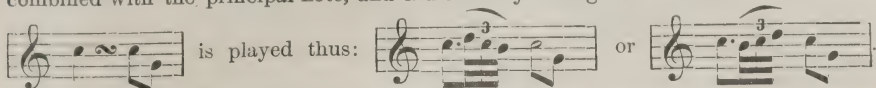
The various Turkish tribes speak very nearly the same language; "so much so, that the Yakut of the Icy sea is said to be intelligible to the Turks of central Asia, and even of Constantinople." In religion, the Turks are for the most part Mohammedans; but the Yakuts are Shamanists; the Turks bordering on the Chinese empire are Buddhists; and those of Siberia Christians of the Russo-Greek church.

TURK'S ISLANDS, a group of small islands in the Bahama archipelago, n. of Hayti; pop. '91, 4745. The chief island is Grand Key or Turk's. The sea-ports are East Harbor, Caicos, Salt Cay, and Grand Turk. Much salt is exported, and there is a considerable floating population which comes every year from the Bermudas to rake salt. The soil of the islands is entirely barren. The group is governed by Jamaica.

TURMERIC, *Curcuma longa*; see CURCUMA, a plant of the natural order *scitamineæ* a native of the East Indies, much cultivated both in India and in Cochin-China. The leaves are lanceolate, sheathing each other at the base, about a foot long; they spring from the crown of the root, and from their center rises a short leafy spike, with small cream-colored flowers. The root is divided into several fleshy fingers, oblong, and as thick as a man's thumb, sometimes crooked when young, and the root then abounds in a kind of arrow-root; but in a more advanced stage, it contains in large quantity a peculiar, resinous, yellow substance, which is used as a dye-stuff, and for other purposes, and is called *turmeric*. It appears in commerce in the form of dried roots, or as a powder. It depends for its value chiefly on a resinous principle called *curcumin*, which is scarcely soluble in water, but easily soluble in alcohol and ether. The yellow color obtained from turmeric is not very durable, although it is employed as a dye both for silk and wool. Chemists make much use of turmeric as a test for alkalies, which change its yellow color to reddish brown, as do also their carbonates and phosphates, some of the alkaloids, and boracic acid. Turmeric test-paper is made by immersing unsized paper in tincture of turmeric. It is much employed in the east in medicine, as a gentle laxative, diuretic, and stimulant. It is also much used as a condiment with many kinds of food, and is the principal ingredient in *curry-powder*. For its cultivation, turmeric requires a rich friable soil, and a situation not liable to be flooded. It is propagated by cuttings of the root, which are planted at distances of eighteen in. or two feet. It is planted in April or May, and the crop is gathered in December. This kind of turmeric is sometimes distinguished by the name of LONG TURMERIC; and

the name of **ROUND TURMERIC** is given to *kempferia pandureta*, a plant of the same order, also a native of the East Indies, the roots of which are shorter and rounder, but otherwise of very similar quality. They are not nearly so much an article of commerce as the other kind, but are particularly valued for the preparation of an artificial gold varnish, as they yield a better color than the long or true turmeric. The Arabic name of turmeric is *kurkum*, whence *curcuma*.

TURN, in music, an embellishment formed by the adjoining notes above and below combined with the principal note, and indicated by the sign ∞. Thus



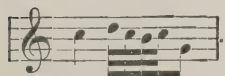
Should another than the principal note follow the turn, the principal note is added

before the next note is played, so as to give the turn four notes; thus:

is played In either of these cases, the turn must be played

during the time of the principal note. But when the sign ∞ is placed above or below the principal note, the first note of the turn takes the place of the principal, which is

played in combination with the others; thus is played



TURNAU (Boh. *Turnáv*), a walled t. of Bohemia, circle of Jung-Bunzlau, on the e. bank of the Iser, 50 m. n.e. of Prague. It has a church, built in 1825, which is reckoned one of the most beautiful in Bohemia. Turnau has manufactures of cotton, woollens, and more particularly artificial gems, which are exported in great quantities to the United States. Pop. '90, 5904. Here was fought (July, 1866) a battle between the Prussians and Austrians, in which the former were victorious.

TURNBULL, ROBERT, D.D., b. Scotland, 1809; graduated at the university of Glasgow; became a Baptist; settled at Danbury, Conn., 1833; pastor of a Baptist church in Detroit, Mich., 1835; of South Baptist church, Hartford, Conn., 1837; of Harvard street church, Boston, 1839; First Baptist church, Hartford, 1845. He was a graceful writer, and published *The Theater; Olympia Morata; Vinet's Vital Christianity; The Genius of Scotland; The Genius of Italy; Theophany, or The Manifestation of God in Christ; Christ in History; Pulpit Orators of France and Switzerland*; edited sir Wm. Hamilton's *Discussions on Philosophy*. He d. 1877.

TURNBULL, ROBERT JAMES, 1775-1833; b. Florida; his father was the founder of a Greek colony at New Smyrna, Fla., but before the revolution forfeited his grants on account of his adherence to the popular side. The son was educated in England, became a Charleston lawyer, and practiced there till 1810. He was conspicuous in politics, prominent in the nullification movement of 1832-33, and wrote pamphlets on the subject. A monument was erected to his memory in Charleston.

TURNBULL, WILLIAM, 1800-74; b. Md.; graduated at West Point, 1819; commissioned in the artillery, served in the topographical corps, and was promoted to a captaincy in the topographical engineers in 1831. He had charge of the construction of the Potomac aqueduct, 1832-43. This was the first work of the kind in this country in which the piers were laid upon the rock-bed by means of coffer-dams, and by surmounting the difficulties of its construction, Col. Turnbull gained high repute as an engineer. In the Mexican war he was with Scott as chief topographical engineer, and took part at Contreras and Churubusco. Among his more important professional works were the building of the New Orleans custom-house, and the Cape Fear river improvements.

TURNER, a co. in s.e. S. Dakota, consisting of fertile prairies; 615 sq.m.; pop. 1890, 10,256. Co. seat, Parker.

TURNER, JOSEPH MALLORD WILLIAM, the greatest of British landscape painters, was born at 26 Maiden lane, Covent Garden, London, in 1775. The precise day of his birth is unknown; but an approximation to it is furnished by his baptism, which is registered in the parish church as of date May 14 of that year. He was the son of a barber, and received an exceedingly defective education. His turn for art showed itself very early, and drew attention to the boy. To a Dr. Monro, in particular, who gave him access to his excellent collection of water color drawings, and otherwise kindly furtherance, he used afterward to express his obligations. In 1789, he became a student at the

Royal academy, where, doubtless, he learned something; but throughout he seems to have been indebted less to any formal teaching than to the tentative efforts of his own singularly original genius. In 1787, when only twelve years old, he exhibited two drawings at the Royal academy. Again, in 1790, he exhibited; and thence onward till his death, with intermission of only one or two years, his pictures were regularly to be found on the walls. His success is sufficiently shown in the fact that so early as 1799 he was elected an associate of the Royal academy, and only three years afterward attained the full dignity of academician. The honor was worthily bestowed on one whose claim was already admitted as the first landscape painter of his time; but his election in 1807 to the post of professor of perspective could scarcely be considered so judicious. A man so abnormally illiterate that his simplest note included a crop of solecisms, was not likely to succeed as a lecturer; and as a lecturer he failed utterly. The knowledge which he abundantly possessed, he could not in the least communicate; and after a very few years, he ceased to make the attempt. In the exercise of his art, Turner traveled much; he was frequently in Scotland, France, Switzerland, and the Rhine countries; and in 1819, 1829, and 1840, he paid visits to Italy. His industry was almost as unexampled as his genius. To the exhibitions of the Royal academy, he contributed in all 259 pictures; but among these, many of his finest works were not included; and in another branch of art, the amount of his achievement was extraordinary. In 1807, he commenced the publication of his famous *Liber Studiorum*, a series of engravings from original designs, which ranks as one of his most important undertakings; to this is to be added his *Scenery of the Southern Coast, England and Wales, Rivers of England, Rivers of France*, etc.; and besides, his services were continually in request as an illustrator. The illustrated edition of Rogers's *Poems* is his most celebrated work in this kind, and is quite unique in magnificence. At his death, which took place Dec. 19, 1851, at Chelsea, where his few last years were passed in a small house by the river side, it was found that he had bequeathed to the nation the noble collection of his works, which now occupies a room in the National gallery, and remains a permanent monument of the power and splendor of his genius, if also of its occasional eccentricity and extravagance. The large fortune, amounting to something like £200,000, which he had amassed by his industry and thrift combined, he left to found an asylum for decayed artists; but owing to some technical defect in his will, this purpose could not be carried out.

Of the genius of Turner, and the various phases through which it was developed till it sunk in the decay and delirium obvious in the work of his few last years, we cannot here attempt to treat. In the eloquent pages of Mr. Ruskin's *Modern Painters*, the subject will be found thoroughly discussed. There are lives of Turner by Walter Thornbury (1862) and by P. G. Hamerton (1878). The picture presented, especially by the former, is a somewhat dark and painful one. This creator of the beautiful on canvas was in his character and way of life by no means so surprising a revelation of it. He was coarse, sensual, sordid, avaricious: of his inordinate passion for money, many odd anecdotes are extant; but it is only fair to say, that by the few friends who knew him intimately, he was held to be essentially a man of kindly and generous nature. He lies buried in the crypt of St. Paul's, beside sir Joshua Reynolds.

TURNER, PHILIP, 1740-1815; b. Norwich, Conn.; pursued his early studies under the direction of Dr. Elisha Tracey, with whom he studied medicine; served as assistant-surgeon under Gen. Amherst at Ticonderoga, 1759; settled in Norwich, 1763; surgeon of the Connecticut troops before Boston, 1775. He attended the army through some of the bloodiest battles of the war; surg. gen. of the e. dept., 1777; afterwards surgeon to the staff of the U. S. army, stationed on York island. He married a daughter of Dr. Tracey.

TURNER, SAMUEL HULBEART, D.D., 1790-1861; b. Philadelphia; educated at the university of Pennsylvania. He took orders in the Protestant Episcopal church, and after officiating as rector of churches in Chestertown, Md., New York, and Brooklyn, became in 1818 professor of historic theology in the New York general theological seminary, and in 1821 professor of biblical learning and scripture interpretation. He was also professor of Hebrew in Columbia college after 1830. Among his works are: *Notes on the Epistle to the Romans* (1824); *Companion to the Book of Genesis* (1841); *Parallel References of the New Testament* (1848); *Thoughts on Scriptural Prophecy* (1852).

TURNER, SHARON, the Anglo-Saxon historian, was b. in London, Sept. 24, 1768, articulated to an attorney at the age of fifteen, and succeeded his master in the business before the period of his clerkship had expired. He continued, however, to gratify his literary tastes; and after years of hard reading and patient collection of materials, published, 1799-1805, a *History of the Anglo-Saxons*, in 4 vols, a work, with all its imperfections, that has given its author a permanent place in English literature. Other writings of Turner's are: *The History of England from the Norman Conquest to 1509* (1814); *History of Henry VIII.* (1826); and *Reigns of Edward VI., Mary, and Elizabeth* (1829); all of which were subsequently republished together under the title of *History of England from the Earliest Period to the Death of Elizabeth*; *Sacred History of the World as displayed in the Creation and Subsequent Events to the Deluge* (1832 et seq.); a volume of essays and poems, etc. Turner died Feb. 13, 1847.

TURNER, THOMAS, b. Va., 1808; entered the navy as midshipman, 1825; rose through successive grades to be rear-admiral, 1868. He served in the Mexican war, was actively engaged at Tuspan in 1847, commanded the sloop-of-war *Saratoga*, and in 1860 took two prizes, Spanish steamers in the harbor of Auton Leyardo, Mexico. During the late civil conflict he commanded the frigate *New Ironsides* in Charleston Harbor, 1863; com. South Pacific squadron, 1869-70; retired, 1870. He d. 1883.

TURNER, SIR WILLIAM, English anatomist, b. 1832, educated at St. Bartholomew's hospital, became a demonstrator of anatomy in the University of Edinburgh in 1854, and professor of anatomy in the same institution in 1867. Besides these offices, he has held various other teaching positions, and for many years represented the University of Edinburgh in the General Council of Medical Education. His articles in scientific journals are very numerous and deal with various topics, both in human and in comparative anatomy. From 1866 to 1894 he was one of the editors of the *Journal of Anatomy and Physiology*. In 1886 he was made a knight. Among his longer works are *An Introduction to Human Anatomy*; *Lectures on the Comparative Anatomy of the Placenta*, and an *Atlas of Human Anatomy and Physiology*.

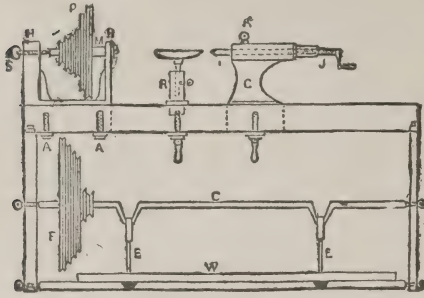
TURNER, WILLIAM WADDEN, 1810-59; b. London; emigrated to New York, and became a printer's apprentice. He studied many languages, was librarian of the university of New York, instructor in Hebrew in the Union Theological Seminary, and librarian of the U. S. patent office. Besides contributions to learned societies and periodicals, he published a translation of Von Raumer's *America and the Americans*, and he translated the most of Freund's *Latin-German Lexicon* for Prof. E. A. Andrews.

TURNHOUT, a well-built t. of Belgium, province of Antwerp, 34 m. e.n.e. of the city of Antwerp, in the district known as the Campine (see BELGIUM), and the terminus of a branch-line of the Brussels and Antwerp railway. The inhabitants manufacture ticking, and linen and lace goods, cutlery, playing cards, paper, oil, etc. Pop. '90, 18,747. Turnhout is historically noteworthy as the scene of two battles, the first won Jan. 22, 1597, by the Netherlands, under Maurice, prince of Orange, over the Spaniards; and the second, Oct. 27, 1789, by the patriots under Van der Mersch, over the Austrians.

TURNING, the art of shaping wood, metal, ivory, or other hard substances into forms having a curved (generally circular or oval) transverse section, and also of engraving figures composed of curved lines upon a smooth surface, by means of a machine called a *turning-lathe*. This art is of great importance and extensive application in mechanics, the most delicate articles of luxury and ornament, equally with the most ponderous machinery, being produced by it. The art of turning dates from a very early period, and Theodorus of Samos (about 560 B.C.) is named by Pliny as its inventor; but long before this period, the *potter's wheel* (see POTTERY) the earliest and simplest form of turning-machine, was in general use, as is evidenced by numerous references in Holy Writ. The immense variety of work performed by turning-machines necessitates great variations in their construction; but their mode of operation is always the same, and consists in fixing the work in position by two pivots or otherwise, causing it to revolve freely round an axis of revolution, of which the two pivots are the poles, and holding a chisel or other cutting-tool so as to meet it during its revolution, taking care that the cutting-tool be held firmly and steadily, and moved about to different parts of the work till the required shape be obtained. Lathes are divided, with respect to the mode of setting them in motion, into *pole-lathes*, *foot-lathes*, *hand-wheel lathes*, and *power-lathes*; with respect to the species of work they have to perform, into *center-lathes*, which form the outside surface, and *spindle, mandrel, or chuck lathes*, which perform hollow or inside work, though this distinction is for the most part useless, as all lathes of good construction are now fitted for both kinds of work. *Bed-lathes* are those used by turners in wood, and *bar-lathes* for the best sort of metal-work; and the small metal center-lathe employed by watchmakers is known as a *turn-bench*.

The primitive and most simple form of lathe for wood-cutting is the pole lathe. It consists of two planks or beams placed horizontally side by side with a narrow space between them, which, being firmly supported at a convenient height, constitute the *bed*; of two uprights or *puppets* rising from the bed, one of them stationary at the left end, and the other sliding along over the slit between the beams, and capable of being fastened at any required point by a projecting tenon and wedge beneath; of a *treadle* below and parallel to the bed; and of an elastic *pole* or *lath* (whence some derive the name lathe) fixed to the ceiling above. This form of lathe is well adapted for turning long thin cylinders of wood, the piece to be turned being held fast at each end by the conical iron or steel point projecting from the inner face of each puppet. Motion is communicated to the work by a cord which is fastened to the lath overhead, wound twice or thrice round the work, and then attached to the treadle below. When the workman presses his foot on the treadle, the work commences to revolve rapidly, unwinding the cord toward the treadle, and winding it up on the side next the pole, causing the latter to bend considerably. During this period the workman has been holding his cutting instrument to the work; but after the treadle has been quite pressed down, he removes his foot, and the reaction of the bent pole causes the work to revolve in an opposite direc-

tion, till the pole has straightened itself; and during this latter revolution no cutting is done. When the whole piece is to be turned, the cord must be moved from an unfinished to a finished part of the work. For the pole, an elastic steel bow and string are substituted when the work is light or fine, the cord being attached to the middle of the string, and the bow fastened to the ceiling by its center. The advantage of the pole-lathe is that it never acquires an impetus in the direction of the cutting motion, for whenever the pressure on the treadle is removed the reaction of the pole takes effect; but the great waste of time during the straightening of the pole and rising of the treadle has caused the abandonment of this machine for the foot-lathe. The foot-lathe, the most common and generally useful form of lathe, differs from the former in having a *head-stock* or *fast-head* in place of the left-hand stationary puppet. This head-stock,



puppet *front-head*, or *tail-stock*, movable along the slit in the bed, and capable of being fastened like the rest; its point, I, can be advanced or retired as required by means of the screw, J. C is the spindle, which, being connected with the treadle, W, by means of the rods or chains, E, E, turns the fly or foot wheel, F, and by means of an endless band connecting the latter with the speed-pulleys, communicates motion to the mandrel. The pulleys on the spindle and mandrel are of different sizes, and so arranged that when the endless band is placed on the left-hand pulleys, an extremely rapid motion is communicated to the mandrel, the motion being reduced more and more as the band is transferred more to the right, till, at the extreme right, the rotatory motion is much slower than that of the spindle. When the foot-lathe is required for center-work, the inner end of the mandrel is furnished with a point similar to I; but when hollow or inside work is to be done, it must be armed with a screw, as in the figure. In this latter case, certain contrivances, known as *chucks*, for holding the work, are screwed on to the end of the mandrel. Some of these most commonly used are the *screw-chuck*, which shows on its right side a flat circular surface, from the center of which projects a large, coarse, conical screw for holding firmly any large piece of wooden work; the *hollow chuck*, a strong circular cup with perpendicular sides, into which one end of the work is firmly fastened by a mallet, or, if too small, by four screws working inward through its sides; the *drill-chuck*, of a cylindrical form similar to the last, but with a square cavity for holding drills, the instrument, and not the work, being made to rotate in this instance; and the *concentric chuck*, a most ingenious piece of mechanism—a flat plate with two slits almost to the center, and in line of a diameter, within which slits works a spindle, with screw-ends carrying two steel studs, whose heads project through the slits above the surface on the right side; these heads carry two curved pieces, which serve as clamps to hold the work; and as the spindle-screws are of the same fineness, and with right and left threads, the revolution of the spindle either removes both further from the center, or brings both nearer to it; hence, when the studs are once set at equal distances from the center, they always remain so, and the work may be removed and replaced without danger of destroying the adjustment. All these chucks are of metal, and are mostly employed for heavy work; turners of wood or ivory preferring wood-chucks, which can be altered as required, and secured by an iron ring round the outside, to prevent splitting. The cutting-tools employed are very various: gouges are used to rough out the work—if soft wood—after which chisels with a straight oblique edge are employed: the instruments for harder materials, such as ivory or bone, are smaller than the former, and have their sharp edges “better backed;” for inside-work, drills are first employed to make an opening, and then cutting-tools of various shapes are employed, according to the form which is wished to be given to the interior surface. To avoid the imperfections in the workmanship arising from unsteadiness of hand in the workman, the *slide-rest* is employed. This valuable addition is furnished with two motions, one toward the work, and the other along, parallel, or at any inclination to it, according as cylindrical or conical figures are required; there is a socket for the chisel, which is firmly held in its place by a screw; and after the slide-rest has been adjusted, the operator has only to move the rest forward or sideways, as may be required, the motions being effected by two screws and winches.

The *hand-wheel* lathe is similar to the former, but so much larger as to require two workmen, one of whom is employed in setting the instrument in motion by turning a wheel, which corresponds to the wheel F in fig. The *power-lathe* is similarly set in motion by horse, water, or steam power, and is employed for heavy metal-work, as piston-rods, iron columns of various kinds, wheels, artillery, etc. This machine differs from the foot-lathe chiefly in the substitution of rack-work, and wheels and pinions, for the endless band, and for manual labor, in the various adjustments of the machine, such as in moving forward the tail-stock, etc.; and in the mandrel being supported by both puppets of the head-stock. In wood-turning, the wood is first prepared by a hatchet and rasp, must be lightly though firmly pressed against by the cutting-tool; while metal-work must be cleared from the sand of the mold or scales of the forge, and in turning, requires less care. Soft woods must be made to revolve with great rapidity; very hard woods and brass require much less velocity; wrought iron and copper, still less; steel, a further diminution of speed; and cast iron, the least velocity of all. After the work has been duly shaped, it requires to be polished; and this is effected while it is still in the lathe and rotating, by applying shark's skin to wood, pumice-stone and chalk to ivory and horn, and emery, tripoli, or putty powder to metals.

Hitherto, we have supposed that the axis of revolution of the work is fixed, and consequently that all work has been turned so as to present a transverse circular section; but many other forms of section may be easily obtained. The general mode of obtaining these non-circular figures is by screwing on to the mandrel an apparatus, by means of which the work can be thrown out of the center of rotation at regular intervals; but as each different class of form requires a separate kind of apparatus, it is impossible here to describe the operations in detail. One species, however, known as *rose-engine turning*, and employed for producing involved curvilinear figures, such as appear on bank-notes and on ornamented gold, silver, or gilt work, is so peculiar and ingenious as to call for more special notice. In this species, the standards which support the mandrel are no longer fixed at right angles to the bed, but are capable of oscillating backward or forward in a plane parallel to the plane of rotation of the mandrel, and are so acted on by a spring that when pushed to one side they are at once restored to their former position on the pressure being withdrawn. Suppose, then, a metal wheel with its rim waved or indented, fastened concentrically on the mandrel, and the mandrel, pushed aside by a fixed steel point or roller, applied to the rim of the wheel; the reaction of the spring against the pressure of the roller will keep the latter in close contact with the waved rim throughout, and will produce a definite oscillatory movement of the mandrel, of the chuck, and the work fastened on it, and consequently—the cutting or graving tool being firmly held by the slide-rest—definite deviations from a circle in the lines marked on the face of the work. The wave-rimmed wheel, called a *rosette*, may be replaced by another, and that by a third, and so on till a sufficient number of different waved lines are obtained. A number of rosettes are generally strung at once on the mandrel, and the fixed guide is brought into gearing by means of a steel band called a rubber, with one rosette after another. Similar concentric curves of greater or less perimeter are obtained by removing the slide-rest from, or bringing it nearer to, the axis of revolution.—For more complete information respecting this most interesting machine, and its many varieties of form and application, see article "Turning" in the *English Cyclopædia*, Holtzapffel's *Turning and Mechanical Manipulations* (Lond. 1847-52), and *Tourneur (Manuels-Roret)*, by Valicourt (Paris, 1858). See illus., GEARING, etc., vol. VI.

TURNIP, *Brassica rapa*, is a biennial plant, with lyrate hispid leaves; the upper part of the root becoming, especially in cultivation, swollen and fleshy. It is a native of Europe and the temperate parts of Asia, growing in borders of fields and waste places. It is commonly regarded as a native of Britain, although in most cases of its being found apparently wild, it may be doubted if it has not derived its origin from cultivated varieties. It has been long cultivated, and is to be found in every garden of the temperate and cold parts of the world as a culinary esculent; it is also extensively grown in fields for feeding cattle and sheep. It was cultivated in India long before it could have been introduced by Europeans, and is common there in gardens and about villages. The cultivated varieties are very numerous. In them, the upper part of the root assumes a globose, oblong, or roundish depressed form. Some are common to the garden and the farm, and some of the largest kinds attain such a size as to weigh 20 or 25 lbs. Although the turnip is of great value for feeding cattle, and the introduction of it into general field-culture was one of the greatest improvements ever effected in the husbandry of Britain, it is not very nutritious, no less than 90 to 96 parts of its weight actually consisting of water. Garden turnips are sown from the end of March to the end of August; field turnips generally in June, it being requisite that they should not be sown so soon as to incur a risk of their throwing up flower-stems in the first year, which, when it takes place, prevents in a great measure the swelling of the root, and renders it coarse and fibrous. In the garden cultivation of turnips, the root is generally intended for use in the first year. In dry weather the plants are apt to throw up flower-stems, and so disappoint the hope of the gardener; which is also the case if the seed is sown too early in spring. Moist cloudy weather is most favorable. Garden turnips are sown, and allowed to grow, much closer than field-turnips; being gradually thinned out, and

the thinnings used even when a small size. The varieties both of garden and field turnips are very numerous. The garden turnips are generally of comparatively small size, more rapid in growth, and more delicate.—The SWEDISH TURNIP, or *RUTA BAGA*, which was introduced into cultivation in Britain, from the north of Europe, more recently than the common turnip, and has proved of very great value to the farmer, is regarded by some botanists as a variety of the same species, and by some as a variety of *brassica napus*, but more generally as a variety of *B. campestris*, a species common in corn-fields and sides of ditches in Britain and the north of Europe.

The cultivated turnip grows best in a rich free soil. The mode of culture varies with the soil. Where the soil is light and dry, a smaller amount of plowing, harrowing, and drilling is necessary than on stiff soils. The turnip is not well suited to clay soils, although it is often grown on them. A complete pulverization of the soil is requisite before the sowing of the seed. On light soils, a crop of turnips generally succeeds wheat or oats. Turnip-land is generally made up in raised drills, by the plow, and the seed is sown by the drilling machine, on the top of the narrow ridges, which are about 27 in. apart. Small doses of guano, super-phosphate of lime, crushed bones, or other such manures, produce great crops of turnips. They seem to act chiefly while the plant is young; and when it is further advanced, it derives nutriment from the soil, and even from the subsoil, by deeply penetrating roots, and from the atmosphere by its large leaves. See BONES, DISSOLVED. The young plants are thinned out by the hand-hoe, to a foot or upward apart, and the ground is stirred and carefully kept clean by the plow or horse-hoe. The turnip-crop is thus of great use in clearing the land of weeds. In many places part of the crop is eaten on the ground by sheep, which are confined to a small part of the field by means of movable fences. It is common to leave one of each three rows of turnips for this purpose, the other two rows being carried to the farm-yard for feeding cattle, or stored. Turnips are stored either in a house or in conical heaps, covered with their own leaves, or with straw and earth. They are sometimes protected from frost by being earthed up in rows by the plow. Some kinds are much more easily injured by frost than others; the Swedish turnips least of all.

The introduction of the turnip as a field crop is one of the most important events in the history of British agriculture. It has rendered possible a rotation of crops, which has been extremely advantageous; and has made the supply of butcher-meat more constant, by providing a supply of winter-food for cattle and sheep, whereas, formerly, all depended on the pasture. Turnip-husbandry was introduced into Scotland from Norfolk in the latter part of the 18th c., but soon attained a development, and was carried to a perfection in Scotland far beyond what it had previously reached anywhere. The climate of Scotland is particularly adapted to it, as is also that of Ireland; moist weather, both in summer and autumn, being suitable to the turnip; whilst the climate of North America is so unfavorable to it that it has not become an important crop there. Of late years, turnip-crops in Britain have suffered very much from the disease called anbury (q.v.), or *fingers and toes*. This is not the case in Norfolk, and the exemption is supposed to be due to the use of clay-marl as a manure; but the whole subject is involved in obscurity. The turnip not unfrequently suffers from a fungus of the genus *botrytis* (*B. parasitica*), allied to that which is supposed to cause the potato disease. It infests plants of rank growth, attacking their roots, which are weakened by the too great luxuriance of the leaves. Plants weakened by drought are liable to suffer from a white mold, a species of *oidium*, which attacks the leaves, and renders the plant worthless. The leaves are devoured by the turnip-fly, turnip-flea, or turnip-beetle (*altica nemorum*), and by other species of the same genus. The nigger caterpillar, the larva of *athalia spinarum*, also devours the leaves, as well as the caterpillars of white butterflies (*ponti brassica repa*, and *napi*), and of some moths. The leaves are also mined by the larvæ of several dipterous flies. Several species of aphids suck the juices of the leaves, and one (*A. floris rapæ*) devotes its attention to the young crops in seed leaf, which are also attacked by a rose-chaffer (*cetonia aurita*), and a minute beetle (*meligethes cæneus*). Slugs, snails, and wire-worms are among the enemies of the turnip.

The young leaves of the turnip are good as greens, and particularly those of the Swedish turnip, when it has begun to sprout in spring.

TURNIP-CUTTER, an implement used for cutting turnips for cattle. It is useful, not only as saving the teeth of sheep, which are apt to be much injured by eating turnips, but as preventing waste, for sheep feeding upon turnips scoop out a part, and leave the rest to rot. The oldest and simplest turnip-cutter acts by mere pressure, and is like a large nut-cracker on a stand. Many kinds are now in use, of which perhaps the best are those having knife-edges on the surface of a cylinder or cone, which are brought to act on the turnips by turning a handle.

TURNIP-FLY, a name given to several insects destructive to turnips. It is often given to *altica* (or *haltica*) *nemorum*, also called TURNIP-FLEA, from its skipping or leaping powers, but which is truly a very small beetle, with long and strong hind-legs, and ample wings, of a shining black color, with two yellowish stripes down the wing-cases, and ochreous legs. It swarms in meadows and hedge-rows in most parts of Britain from March to October, the larva feeding on many cruciferous plants. It often commits great ravages in turnip-fields, while the turnips are very young. The female lays her

eggs on the under side of the leaf, and the minute larva mines in the leaf, under the skin, making a tortuous gallery. Farmers sometimes steep the seed of turnips, in order to prevent the ravages of this insect, but no good can be thus done, as the eggs are not in the seed.

The **TURNIP-FLY**, more properly so called, is *anthomyia radicum*, a dipterous insect of the family *muscidae*, and of the same genus with the cabbage-fly and beet-fly. It attacks the root of the turnip, as the cabbage-fly does that of the cabbage, the larva living in the root.

TURNIP SAW-FLY. See **SAW-FLY**.

TURNPIKE ROADS. See **HIGHWAY, TOLL**.

TURNPIKE STAIR, a turret stair revolving round a central newel.

TURNSOLE, a peculiar coloring material consisting of very coarse linen rags, usually pieces of sacking, prepared by cleaning and bleaching, and then dipped into the juice of the leguminous plant called *crozophora tinctoria*, previously mixed with ammoniacal matter, and exposed to the air for some time. It is made in France, but is exclusively used in Holland, but for what is not certainly known: it is said, for coloring cheese, pastry, etc.

TURNSTONE, *Streptilas interpres*, a bird of the plover family (*charadriadae*), very widely distributed, and, indeed, found in almost every part of the globe. It appears in Britain, chiefly as a winter bird of passage, but breeds in the Shetland islands. It frequents the sea-shore, and derives its English name from its habit of turning over small stones with its bill in search of food. It is the only known species of its genus. The eggs, which are four in number, are laid on lonely rocky coasts where there is sparse vegetation. They vary very much in color and markings, and are cunningly concealed. The whole length of the turnstone is rather more than 8 inches. The plumage varies with the age of the bird and the season. In August the plumage begins to get dull.

TUR OČZ, a co. in n.w. Hungary, crossed by the Carpathian mountains; 444 sq. m.; pop. '90, 49,979. Capital, Szent-Márton.

TURPENTINE is a semi-solid resin which is yielded by various species of pine, and by some other trees when incisions are made into them. The chief varieties of turpentine are *common turpentine*, yielded by *pinus abies*; *Venice turpentine*, yielded by the larch; *Bordeaux turpentine*, yielded by *pinus maritima*; and *Chian turpentine*, yielded by *pistacia lentiscus*. The Venice turpentine, which is regarded as the best variety, occurs as a clear, transparent, pale yellow, viscous mass, of a balsamic odor, and an acrid bitter taste, perfectly soluble in spirits of wine, and increasing in density on prolonged exposure to the air. On distilling it with water it yields a considerable quantity of essential oil, vulgarly known as *spirits of turpentine*. This oil of turpentine (which, from its greater cheapness, is usually obtained from common turpentine) is, after rectification, represented by the formula $C_{20}H_{16}$ and has a spec. grav. of 0.864, and a boiling-point of 320°. It is colorless, transparent, has a strong refractive power, a strong peculiar odor, and a disagreeable acrid taste. It is readily soluble in alcohol, in ether, and in the fixed and essential oils, but is insoluble in water, on which it floats. It is a good solvent for many substances, among which may be especially mentioned sulphur, phosphorus, caoutchouc, and the various resins; and is largely used in many departments of the arts, forming a large proportion of all oil paints. Great quantities are exported to Europe from the United States, where it is mostly yielded by the swamp-pine.

Turpentine is an energetic producer of ozone (q.v.); and on keeping it for a long time in a stoppered flask, which should be occasionally shaken, the odor of ozone is very distinct on opening the vessel. Oil of turpentine forms three hydrates, of which two are solid. Commercial oil of turpentine often consists of a mixture of several isomeric hydrocarbons which act oppositely on polarized light (like the several varieties of sugar). Deville and Berthelot have ascertained that there are various modifications of which this oil is susceptible without its undergoing any change in its chemical composition. Of these, *isoterebenthene* and *metaterebenthene* differ *inter alia* in their boiling-points, and may thus be separated; *terebene* (which has an odor resembling that of oil of cloves) and *colophene* are obtained by acting on the oil with sulphuric acid; and *camphylene* and *terebylene* by decomposing artificial camphor (which is a combination of the oil with hydrochloric acid) by means of quicklime.

Under the influence of nitric, hydrochloric, and sulphuric acids, chlorine, etc., oil of turpentine yields many products of interest to the chemist, but as yet of little practical value.

Oil of turpentine is used to a considerable extent in medicine, although, from its disagreeable taste, and from certain bad effects which occasionally follow its use (as strangury, bloody urine, vertigo, a species of intoxication, and an eruption on the skin), it is often supplanted by less certain remedies. It is probably the most effective remedy for the expulsion of tapeworm, is nearly equally efficacious over the lumbrici or round-worms, and in the form of an injection is serviceable in the case of ascarides or thread-worms. For an adult, in the case of tapeworm or round worm, the dose should be one ounce, combined with an equal quantity of castor-oil, or made into an emulsion with yolk of egg or mucilage. In the case of children and delicate women, it is better to try a milder vermicide (see **VERMIFUGES**). In doses of from two drams to two ounces, and

in similar combination with castor-oil, it may be given as a cathartic in cases of obstinate constipation, especially when dependent on affections of the brain; in hysteria, epilepsy, tympanitis, passive hemorrhage, and in purpura hemorrhagica, in which last-named disease Dr. Neligan highly recommends it. In small doses (as from 10 to 20 minims), oil of turpentine is regarded as a diuretic; but it must be given with caution, in consequence of its stimulating properties. It is of more service in chronic mucous discharges of the genito-urinary organs, as gleet, leucorrhæa, etc., than in dropsy. In small doses, it is often useful in chronic rheumatism and in sciatica. In the Dublin school, it is much employed in small and repeated doses as a general stimulant in the low stages of continued fever. *Turpentine punch* has long been a favorite remedy in the Meath hospital (where Graves and Stokes made their reputation) in these cases. It is composed of an ounce of oil of turpentine, two ounces of brandy, eight ounces of boiling water, and a sufficient quantity of sugar. A third of this should be taken for a dose, and should be repeated if necessary every third hour. When applied externally, oil of turpentine is a speedy and powerful rubefacient and counter-irritant, and is beneficially used in this capacity in inflammatory attacks of the throat, chest, and abdomen. The best method to pursue is to rub the oil by means of a bit of flannel over the part to be acted on; over this to lay three or four folds of flannel, wrung out of hot water, and over the flannel to place a dry towel; two or three such applications produce a sufficient result. There is a *liniment of turpentine* which is powerfully stimulating, and is applied as a dressing for extensive burns; and is likewise used, with friction, in rheumatic and neuralgic cases. There is also the *liniment of turpentine and acetic acid*, which is the official representative of the well-known *St. John Long's* liniment, and is an excellent counter-irritant (applied with a sponge) in pulmonary consumption and other chronic pulmonary affections. Lastly, *ointment of turpentine*, a warm stimulating application, requires mention.

It was mentioned at the beginning of this article that on distilling turpentine with water, the oil comes over. The residue left in the retort constitutes common *resin* (or *rosin*), known also as *colophony*. See RESINS.

TURPENTINE TREE. See PISTACIA.

TURPIN, Archbishop of Rheims, friend and companion of Charlemagne, and eye-witness of the exploits he relates—such are the names and qualifications assumed by the author of a chronicle in Latin prose narrating the expedition of the Frankish emperor against the Saracens of Spain, and particularly the events that preceded and followed the battle of Roncevalles (q.v.). That a Bishop Turpin existed about this period is admitted, but the very documents in which he is mentioned, state that he was slain at Roncevalles. There was also an Archbishop Turpin of Rheims (753–800 A.D.), but he has no claim to the description given above; and, in fact, all internal evidence leads to the conclusion that it is a work of the 11th century. It seems to have sprung out of the epic ballads and traditions of the Carlovingian heroes, while these were still in a comparatively pure condition; but through the legendary manner in which they are told, there is visible a monkish aim—viz., to encourage the foundation of churches and monasteries, the undertaking of religious wars against the Saracens, and above all, the pilgrimage to San Jago de Compostella. Now, as in the year 1190, a brother of the archbishop of Vienne (subsequently pope Calixtus II.) obtained by marriage the countship of Galicia; as it was from Vienne that the pseudo-Turpin's chronicle was recommended to the rest of Christendom; as the same archbishop was detected on several other occasions fabricating false documents; as subsequently, in his quality of pope, he himself pronounced the chronicle authentic in a bull of 1122 (the authenticity of which has, however, been questioned); as he pursued the same family policy in his acts as pope, and in his sermons in honor of San Jago; finally, as the chronicle of the pseudo-Turpin is very often followed in the MSS. by a dissertation of Calixtus upon the miracles of San Jago, it has seemed to critics highly probable either that pope Calixtus wrote the work himself, while yet archbishop of Rheims (*circa* 1090), or, at least, that he took an important part in its composition. The book soon acquired a great popularity, was translated into French after 1206, and was made use of by divers chroniclers, as the author or authors of the *Chroniques de Saint-Denis*, Vincentius Bellovacensis, etc. The chronicle is of great historic value, in spite of all the embellishments it has from time to time received; for, as one of the most ancient traditions of the time of Charlemagne, it has preserved numerous traits and details with more purity and fidelity than the poems of the Carlovingian cycle, which are generally of later date. The chronicle has been printed in Reuber's edition of the *Scriptores* (Hanau, 1619; Frank., 1726).

TURPIN, "Dick," a famous highwayman, was born in Essex, England. He was a butcher, and supplied his shop with meat, whenever he could, by depredations on his neighbors' cattle. Being discovered, he fled, joined a gang of thieves, with whom he soon quarreled, and went off into York, where he passed for a gentleman. He was soon suspected, and finally captured with some stolen horses, tried, and executed April 10, 1739. Turpin's reputation as a hero, and a man of courage and generosity, are mere fabrications of some ingenious writer. In *Rookwood*, a novel by Ainsworth, Turpin is a prominent character.

TURQUOIS, a mineral hitherto found only in the province of Khorassan, in Persia, and much prized as an ornamental stone. It is essentially a phosphate of alumina, containing also a little oxide of iron and oxide of copper. It is harder than felspar, but softer than quartz, and has a greenish-blue color. It is opaque, or sometimes translucent at the edges. It is sometimes called oriental turquois; while the name occidental turquois is given to a substance of similar color, found near Simon, in Languedoc, which is said to be merely bone colored with phosphate of iron.

TURRETIN, or **TURRETINI**, FRANÇOIS, 1623-87; b. Geneva; studied theology first in his native city and afterward in Holland; pastor at Geneva, 1647; removed to Leyden, 1650; recalled to Geneva as professor of theology, 1653. His principal work, *Institutiones Theologiæ Elencticae*, ranks high among the expositions of Calvinistic theology. His complete works were published at Geneva (1688, in 4 vols). His son, JEAN ALPHONSE, 1671-1737, b. Geneva, was professor there of ecclesiastical history, and author of several valuable works relating to his department.

TURRET-SHIP, a recent invention in naval warfare, consists of an iron-plated vessel rising but slightly above the water. In the middle of the deck are one or more turrets incased in the most massive plates, and holding each one or two guns of heavy caliber. The turret, in American vessels, is pivoted on the keel or other firm base; in English specimens it revolves on rollers under the periphery. By means of simple mechanism, it can be made either by a steam-engine or by hand, to revolve with considerable speed, thus giving the gun a range in every direction. Turret ships were first proposed in America, by Mr. Theodore R. Timby, of New York, and were patented in Gt. Britain by Capt. Cowper Phipps Coles of the royal navy, who, after much discussion with the admiralty, was allowed to adapt the *Royal Sovereign*, a wooden vessel which had been built for a three-decker, to his designs. The plan was tried under disadvantages, as the ship had not originally been destined for such heavy work. Notwithstanding, the *Royal Sovereign*, as a turret-ship, was declared by competent officers to be at that time the most powerful vessel in the British navy. Almost simultaneously in the United States, similar vessels, called "monitors," sprang into existence, the principal point of difference between them and the British build being that their hulls are almost entirely submerged, the turrets being wholly above the upper deck; while, in the latter, the hulls rise higher from the water, and the turrets are sunk below the deck, except in so far as is absolutely necessary for discharging the ordnance. The British model gives the advantage of higher free-board, and consequent greater safety in heavy seas. Capt. Coles lost his life in the greatest naval catastrophe of modern times, the capsizing of his great turret-ship, the *Captain*, with about 600 souls on board, in the bay of Biscay, in Sept., 1870. This vessel was built after his complete design; but naval architects attribute her loss to a low free-board, coupled with heavy masting. It has for several years been in dispute whether to trust to turret-vessels or to ships with their battery in broadside. Under the administrations of lords Palmerston and Russell, the admiralty built broadside vessels. Lord Derby's government signalized their accession to power in 1866 by immediately ordering four iron turret-ships of immense power and 4,000 tons each.

Among the advantages claimed for turret-ships are—that much heavier ordnance can be carried centrally than at broadside, with equal dislocating pressure on the keel; that in a sea the platform from which aim is to be taken is steadier at the center; that the mark offered to the enemy is smaller; and that the gunners are safer, as the turret can be turned with its port-hole away from the enemy during loading. The *Devastation*, with her 35-ton guns, has been exceeded in power by the *Inflexible*, whose armor-plating, amidships, is two ft. thick, and which is furnished with two turrets, each containing two 81-ton guns. See NAVIES, MODERN; ARMOR PLATES. Hydraulic power enables the loading and firing to be conducted by two men only.

TURRITELLIDÆ, a family of gasteropodous mollusks, having a much elongated spiral shell, the lower spires remarkably separated. The name turret-shell is often given to them.

TURTLE, the popular name of those chelonian reptiles, the family *cheloniadæ* of some, which have a rather flat carapace, and fin-like paddles instead of legs, suited for swimming, and not for walking. The fore-limbs are much longer than the hind-limbs. The toes are not all furnished with nails; in some species, there is only one on each foot, in others there are two. Turtles are all marine, and although they lay their eggs on the beach, seldom visit the shore for any other purpose. They deposit their eggs in holes, which they scoop in the sand with their hind-feet. The eggs are numerous, one hundred and fifty or two hundred being often deposited at a time, and the turtle lays several times a year. The young, soon after being hatched, make their way through the sand which covers them, and immediately betake themselves to the water. The eggs are hatched by the heat of the sand alone, and the young receive no attention from their parents. Turtles crawl slowly and awkwardly on the shore; but their movements in water are comparatively quick, and even graceful. Some of the species feed entirely on grass-wrack and sea-weeds; which their powerful, hard, and sharp-edged jaws cut with great ease; others prey on crustaceans, mollusks, and fishes. Their jaws are powerful enough to crush very large shells, and the carnivorous turtles are in general more rapid in their movements than the others. The flesh of those which

subsist on animal food is musky and unpleasant; but that of the species whose food is vegetable is much esteemed. In many tropical countries, turtles, after being captured, are kept in enclosures to which the tide has access, to be killed when they are wanted. They are capable of subsisting long without food, and are imported alive from the West Indies into Britain, to supply the tables of the wealthy. In tropical countries, turtles are often very cheap. Their eggs are a much-esteemed article of food in the countries where they are found, and are sought for by probing the sand with a light stiff cane in the places known to be frequented by turtles. Turtles are easily taken when they come ashore for the purpose of laying their eggs, and one after another may be turned on its back—in which position it is helpless, and cannot make its escape—till a sufficient number is secured. They are also, however, taken in the sea, being cautiously approached by boats when resting, or apparently sleeping, at the surface, or by divers when descried at the bottom in their feeding-grounds. A small harpoon is used, or a rope is thrown over the head of the turtle. Turtles are sometimes pursued by boats in shallow parts of the sea until they are exhausted, the clearness of the water permitting them to be seen even when they dive; and when the boat gets near enough, a man leaps overboard, and seizes the turtle, clinging with both hands to the shell. It is said that at Mozambique a species of sucking-fish (*echineis*) is used for catching turtles, a cord being attached to the fish, which is allowed to swim away in the sea, and is sure to fasten itself firmly to the first turtle it meets. See *illus.*, CROCODILES, ETC., vol. IV.

The most esteemed turtle of the West Indies is the GREEN TURTLE (*chelonina mydas*) which is the only kind imported into Britain for aldermanic and other feasts. The green turtle attains a large size, being sometimes six or seven feet in length, and weighing 700 or 800 lbs. The plates of its carapace do not overlap one another; the central ones are almost regular hexagons. The popular name is derived not so much from the external color, which is mostly a dark olive, passing into dingy white, as from that of the fat, so much prized by epicures.—Another excellent species of turtle is the EDIBLE TURTLE (*chelonina virgata*) of the East Indies, which is frequently four or five feet long.—The HAWKBILL TURTLE (*caretta imbricata*), found in the warmer parts of the Atlantic ocean, in the Indian ocean, and in the Red sea, is particularly valuable, as yielding the best tortoise-shell (q.v.). It is one of those turtles which have the plates of the carapace imbricated, or overlapping one another like tiles. Its flesh, although not so much esteemed as that of the green turtle, is a good article of food; its eggs are also very good.—There are other turtles, having the head of a larger size, and the jaws curved toward one another at the extremity, of which one is the LOGGERHEAD TURTLE (*caouana olivacea*), a native of the warmer parts of the Atlantic, and a very rare visitant of the British seas. Others, again, have the carapace and plastron not hard, but leathery, and sometimes soft enough to yield to the pressure of the finger. One of these is the CORR-ACEOUS TURTLE (*sphargis coriacea*) of the Mediterranean and Atlantic, occasionally, but rarely, found even on the British shores. It attains a very large size, even greater than any of the species already described, but its flesh is coarse and unpleasant.

The French, encouraged by their success in pisciculture, have attempted to introduce the green turtle on the southern coasts of France.

TURTLE-BACK. See WHALEBACK.

TURTLE-DOVE, or TURTLE, *Turtur*, a genus of *columbidae*, having the bill more slender than pigeons, the tip of the upper mandible slightly bent down. They are also more slender and elegant in form than pigeons, and generally smaller; the wings are longer and more pointed; and the tail is longer, rounded, or slightly graduated. There are numerous species, natives of warm climates. Their soft and gentle, yet loud *cooing* has attracted attention even more than their beauty, and made them a favorite subject of allusion in poetry. *T. risorius*, the most common species in Palestine, and probably the one intended in the Song of Solomon, is about ten inches in entire length, with a short tail; the general color gray tinged with red; the upper parts greenish brown, with a black collar on the back of the neck. It is often kept in confinement, and becomes very tame.—Very similar to this in size and form is the COMMON TURTLE-DOVE (*T. communis*), a native of almost all the warmer parts of the Old World, a summer visitant of the s. of Europe and of England, where it is chiefly found in the south-eastern counties. In Kent, flocks of twenty or more are often seen, particularly in the pea-fields. The tail is long and much rounded; the plumage soft, and without gloss, exhibiting finely-mingled tints of gray and brown; the crown of the head bluish; all the tail-feathers tipped with white; a black patch on each side of the neck. Other species of turtle-dove, from different parts of the world, as well as these, are not unfrequently kept in confinement, and are very gentle, if not very intelligent pets. Their cooing resounds through a whole house.

TUSCALOO'SA, city and co. seat of Tuscaloosa co., Ala.; on the Black Warrior river, at the head of steamboat navigation, and on the Queen and Crescent Route railroad; 56 miles s.w. of Birmingham. It is the seat of the university of Alabama, the Central female college (Bapt.), the Tuscaloosa female college (Meth. Epis., S.), the Stillman institute for colored students (Pres.), and the state hospital for the insane, and has a public high school, Pierson library in the hospital for the insane, Stillman institute

library, university library, national banks, large coal and cotton interests, and daily, weekly, and monthly periodicals. Pop. '90, 4215.

TUSCALOOSA, a co. in n.w. Alabama, containing a part of the coal field of Alabama; 1346 sq. m.; pop. '90, 30,352. Co. seat, Tuscaloosa.

TUSCANY, formerly a sovereign grand duchy in the w. of Italy, lying for the most part, but not wholly, s. and w. of the Apennines, in lat. $42^{\circ} 20' - 44^{\circ} 10' \text{ n.}$, and long. $10^{\circ} 15' - 12^{\circ} 20' \text{ east.}$ Area, 9304 sq. m.; pop. in 1860, at the date of its annexation to Sardinia, 1,800,000; estimated pop. '95, 2,310,534. The n. and n.e. of the country is filled with mountains, whence numerous rivers and streams flow down to the sea, the most important of which are the Arno (q. v.), the Serchio, and the Ombrone. This district is also the source of the Tiber (q. v.). The rest of Tuscany is an undulating region of hills and dales, except the coasts, which are flat and marshy. Of these marshlands, the largest is (or was) the *Maremma* (q. v.). Tuscany, as a *compartimento* of the kingdom of Italy, comprises the administrative provinces of Arezzo, Firenze, Grosseto, Livorno, Lucca, Massa e Carrara, Pisa, and Siena.—The ancient history of Tuscany is described at length in the article *ETRURIA*, and its mediæval history in the article *FLORENCE*. It is only necessary to add that modern Tuscany was first constituted in its present dimensions in 1569, when Cosmo de' Medici became grand duke of Tuscany. On Aug. 16, 1860, the national assembly of Tuscany pronounced the deposition of the reigning dynasty; and, four days later, declared for annexation to Sardinia.

TUSCARA WAS, a co. in e. Ohio; 539 sq. m.; pop. '90, 46,618, chiefly of American birth, with colored. Co. seat, New Philadelphia.

TUSCARORAS, a tribe of North American Indians, who, at the settlement of North Carolina, had 15 towns on the Tar and Neuse rivers, and 1200 warriors. In 1711 they began a war with the settlers, and, after a series of savage encounters, were defeated, and joined the Iroquois in New York, where they became allies of the English.

TUSCOLA, a co. in e. Michigan, having Saginaw bay on the n.w.; 830 sq. m.; pop. '90, 32,508. Co. seat, Caro.

TUSCULUM, anciently a city of Latium, about 15 m. s. of Rome, was situated on a ridge of hills known as the *Colles Tusculani*, and forming part of the Alban range. We ought not to infer from its name (as Festus does, *s. v. Tuscos*) that it had any connection with the Etruscans. Mythically, it derived its origin from Telegonus and Circe; but we catch the first certain glimpse of its historical existence toward the close of the regal period at Rome. Then, however, it appears in the enjoyment of a high degree of prosperity and power, and therefore its beginnings are in all probability remote. Octavius Mamilius, ruler of Tusculum, and the foremost prince in Latium, married a daughter of Tarquin the Proud (see *TARQUINIUS*), and played a conspicuous part in the last of the great struggles made by the banished tyrant to regain his kingdom. On that occasion, the Latins were so thoroughly beaten (see *REGILLUS LAKE*) that they were fain to enter into an alliance with the victor, and ever after—except in the single instance of the great Latin war (340–338 B. C.)—remained steady in their attachment and fidelity to Rome. As early as 378 B. C., the inhabitants of Tusculum received the Roman franchise, and among its many distinguished *gentes* may be specially mentioned the Porcian, which produced two famous men of a thoroughly "Roman" stamp, Cato major and Cato minor. Toward the close of the republic, Tusculum became a famous country residence of the wealthy Romans. Lucullus had a villa here (with parks and gardens extending northward for miles); so had Cato, Brutus, Hortensius, Crassus, Cæsar, and Cicero. The villa (*Tusculanum*, Tusculum house) of the great orator is peculiarly memorable as the place where he composed many of his philosophical works, and particularly those charming dialogues (*Tusculanæ disputationes*) which derive their name from it. Long after the western empire had fallen, Tusculum continued to flourish. As late as the 12th c., the ancient city continued entire; but in 1191 it was stormed by the Romans (between whom and the Tusculans there had long been a deadly feud), and razed to the ground. It never recovered from this blow; but lower down there arose from its ruins, if we may so speak, the town of Frascati (q. v.). Many fine remains of ancient Tusculum have been dug up in recent times, the most remarkable, perhaps, being the amphitheater, theater, and city walls.

TUSSILA'GO, a genus of plants of the natural order *compositæ*, suborder *corymbifera*, having bractæ with a membranous edge, a naked receptacle, a hairy pappus; the florets of the ray pistilliferous, in many rows, tongue-shaped; those of the disk perfect, few. *T. farfara*, sometimes called *COLT'S-FOOT*, is the only British species. It has single-flowered scaly scapes, appearing before the leaves in early spring, the flowers yellow, both disk and ray; the leaves heart-shaped, angular, downy beneath. The leaves have a somewhat glutinous and subacid taste, and are used either by smoking, or in the form of a decoction, for relief of asthma and troublesome coughs. They have been used with advantage in scrofula.—Nearly allied to this genus is *petasites*, of which one species, the *BUTTER BUR* (*P. vulgaris*, formerly *tussilago petasites*), is a native of Britain. The leaves resemble those of *tussilago farfara*, but are much larger; the flowers also appear before the leaves, but in a dense thyrsus, and are of a pale flesh-color. The flowers of

both are much sought after by bees, as are those of *P.* (formerly *tussilago*) *alba*, *P.* (formerly *T.*) *fragrans*, natives of the s. of Europe, not uncommon in gardens. See *illus.*, *FLOWERS*, vol. VI.

TUTTI, or **TUTTO** (Italian, from the Latin, *totus*, all), a musical term signifying that all the parts are to be played together in full concert.

TUTTLE, DANIEL SYLVESTER, D.D., b. N. Y., 1837; graduated at Columbia college, 1857; studied theology in the General Theological Seminary (Protestant Episcopal); consecrated bishop of Montana, including in his jurisdiction, Idaho and Utah, and subsequently bishop of Missouri.

TUTTLINGEN, a t. of Württemberg, on the right bank of the Danube, 20 m. w.s.w. of Sigmaringen. It has shoe factories, tanneries, and manufactures of surgical instruments. Pop. '90, 10,092. Tuttlingen is historically notable as the scene of a battle in 1643, during the Thirty Years' war, in which an Austro-Bavarian force, under Hatzfeld and Mercy, defeated the French.

TUTUILA, an island in the Pacific, belonging to the group of the Navigators' or Samoan islands (q.v.), is about 17 m. long and 5 m. broad, and is said to contain about 3750 inhabitants. The coast is bold, and the island is traversed by sharp-peaked mountains, highly picturesque in outline, and rising to from 2500 to 3500 feet. The harbor of Pago Pago, an ancient crater, is very deep, and completely landlocked by lofty mountains. The mountains are clothed with dense green forests, comprising the bamboo, banana, cocoa-nut tree and other palms. Between the months of November and May, fearful hurricanes break over the island, and so powerful is their effect, that they are said by the natives to *skin the land*.

TUXEDO PARK. The region of country now known as Tuxedo Park comprises about 4558 acres of land, at the extreme south corner of Orange County, in the state of New York, with a small portion crossing the Rockland County line. It is situated in the heart of a mountainous district at the junction of the Blue Ridge and Alleghany Ranges, which cross each other at this point, the Blue Ridge running very far north to form the Green Mts. of Vermont, the Alleghany stopping with the Shawangunk and Catskills. The local name of the hills in which lie Tuxedo park and lake is the Ramapo. The region is, of course, rugged and mountainous, presenting superb points of view, of which the great lake and outlying ponds are most picturesque features. The rock formation is common granite and drift, interspersed with limestone. In the immediate neighborhood are large deposits of iron ore, as, for instance, at Ringwood, where the Hon. Abram S. Hewitt has his extensive furnaces and iron works. Mr. Hewitt has also a sumptuous summer residence at Ringwood with hundreds of acres laid out in park, garden, and pleasure grounds.

The origin of the name Tuxedo has been variously explained. Mr. William Waldorf Astor, in his Report to the Executive Committee of the Tuxedo Club, after an exhaustive investigation of the subject, and an examination of the language of the Algonquins, who occupied this region, comes to the conclusion that it is a corruption of two or more Indian words. Mr. Astor says: "It was suggested that a frequent habit of the Indians was to name a place after the chief whose tribe occupied it, and this clew being taken up, mention was discovered of a sachem named 'P'tauk-Seet, the bear,' who in the seventeenth century ruled over a tract of country including Tuxedo. Uniting his name with 'tough,' the Algonquin for 'place,' we should infer the original spelling to have been P'tauk-Seet-tough, and its meaning 'The Home of the Bear.'" The first description of this section of country was written, according to Mr. Astor's report, by the Marquis de Chastellux, a French officer, who came to this country with La Fayette, and who, on Dec. 19th, 1780, following the Continental Road through the gorge south of the lake then called "The Clove" presently came in view of Tuxedo. The marquis writes: "I got on horseback and penetrated afresh into the woods, mounting and descending precipitous hills until I found myself at the edge of a lake so secluded that it is hardly visible from the surrounding thicket. Its banks are so steep that if a deer made a false step on the top, he would infallibly roll into the lake. This lake, which is not marked upon the charts, is called Duck Sider, and is in the wildest and most deserted country I have yet passed through." Nothing appears to have been done to develop or cultivate this desolate region, or to utilize its vast material advantages for more than a hundred years from this date. In 1884 Mr. Pierre Lorillard, a wealthy and influential citizen of New York, conceived the idea of purchasing the tract and converting it into a vast park and pleasure ground, including a club house and building sites for men who were able to pay for the comforts and advantages that he would provide. Mr. Lorillard began work immediately, overcoming all the obstacles and difficulties that nature had put in his way, grading and leveling, building and constructing, until an ornamental domain so perfect and beautiful that it has been compared to an English nobleman's country seat, grew out of the wilderness in the Ramapo mountains. A number of Mr. Lorillard's friends, when they saw what his liberality had accomplished, joined with him in the enterprise, and in 1885 it was incorporated as the Tuxedo Park Association. Only a year later, in June, 1886, a magnificent club house, standing in its own grounds and approached by roads unequaled in any part of

the world, was formally opened to subscribers. Since then one hundred and seventy acres of building sites have been sold at an average price of \$3200 per acre. Cottages have been erected, grounds laid out, the park stocked with deer, the lakes with trout, and the woods with game. Trout raising has been a great success, and in 1890, 22,000 trout averaging about four to the pound were turned out, and 3000 pounds of fish sold. The wild flora that abound in the woods make the neighborhood a paradise for botanists. Wild orchids of many different families, an immense variety of asters, the red and blue cardinal flower, the fringed gentian, pyrola, trailing arbutus, as well as many healing and medicinal plants are to be found there. Handsome specimens of wild animals, such as gray and red foxes—others—the mink, coon, and lynx, have been captured by the gamekeepers, as well as almost every variety of North American birds. The material growth of the place has been rapid. There are now fifty-five resident members, and the total number of souls in the park proper and village is estimated at about 1800. Everything inside of Tuxedo is private property, and the cost of running it, including the pumping of water, repairing roads, cleaning and flushing sewers, lighting the roads, policing the park night and day, and the incidental planting and keeping the public parts in order is paid by the property owners, and the association in proportion to the amounts invested.

The Club House combines everything in the way of elegance and comfort; handsome dining, drawing, and ball-rooms, the latter with a stage, scenery, and every requisite for amateur performances. Tennis courts, billiard-rooms, and bowling alleys are in different parts of the grounds, and in winter the Tuxedo toboggan slide is the resort of all who love Russian sports. There are also boat-houses, with every facility for matches and regattas, all for the benefit of members and subscribers, who have united with Mr. Lorillard in bringing this herculean enterprise to a thoroughly successful issue.

TUYERE, the nozzle or small pipe through which the air is forced into a blast-furnace.

TVER, a government of Great Russia, bounded on the n.w. by the government of Novgorod, and on the s.e. by those of Moscow and Smolensk. Area, 25,180 sq. m.; pop. '94, 1,930,015, mostly Russians. In configuration, the government is an elevated table-land, forming part of the Valdai plateau, which throws off rivers that run n.w. into the Baltic, and s.e. into the Caspian sea respectively. The chief rivers are the Volga (with its affluents, the Tvertza, and the Mologa), the Western Dwina, the Msta, and the Tsna. Most of these rivers rise in the n.w. of the government.

TVER, a city of Great Russia, capital of the government of the same name, stands at the confluence of the Volga with the Tvertza, 348 m. s.e. of St. Petersburg, by the St. Petersburg and Moscow railway. The Volga, which is here wider than the Thames at London bridge, becomes first navigable for steamers at this town, although there is much difficulty in accomplishing the voyage hence to Nijni-Novgorod when the water is low. Tver is a well built city, with handsome squares and fine broad streets, is the seat of the governor and of an archbishop, has numerous churches, a theater, and a statue of Catharine II. Pop. '97, 53,477.

TWAIN, MARK. See **CLEMENS, SAMUEL LANGHORNE**.

TWEED, the most famous of Scottish rivers, rises in the extreme s. of Peeblesshire, at an elevation of 1500 ft. above sea level. It flows n.e. to near Peebles, thence e. by s. to its junction with Ettrick water, and thence in an easterly and finally north-easterly direction to its embouchure in the North sea at Berwick-on-Tweed. The river drains great part of Peeblesshire, traverses the northern districts of Selkirk and Roxburgh shires; and in its lower course it forms the boundary between Berwickshire on the n.w. and the English border-land on the s.e. It receives the Ettrick, the Teviot, and the Till from the s.; and the Gala, Leader, and Adder from the north. The Tweed passes Peebles, Innerleithen, Melrose, Dryburgh abbey, Kelso, Coldstream, and Berwick, where it falls into the sea after a course of 96 m., and having drained an area estimated at 1870 sq.m.—greater than that of any other Scottish river, except the Tay. The highest regions through which the river flows are for the most part of the nature of moors; the middle course of the river is through narrow valleys, flanked by hills, clothed with woods or in pasture; and its lower course, through wide-spread valleys, picturesque and beautiful, and through the rich plain of the Merse (see **BERWICKSHIRE**), has many attractions. The tide is felt at Norham castle, 10 m. from the mouth of the river; but there is little or no navigation above Berwick. Possibly the Tweed owes its fame more to the associations which connect themselves with it, than to the charms of the scenery through which it flows. Traversing the heart of the "borders," it has been witness to many a foray between the warrior-farmer n. and s. of its banks, as well as many a deadly struggle between the rival houses of the s. of Scotland; and its name is frequent in ballad and story. The Tweed is famous as a salmon and trout stream.

TWEED, WILLIAM MARCY, 1823-78; b. N. Y.; son of a chair-maker, and followed the same business, receiving slight education; entered politics while a very young man, and was an alderman in 1850, and member of congress in 1853. In 1857-59 was school commissioner of the 7th ward; became a member of the board of supervisors of the county (New York), and president of the board during four successive terms. In 1867 and 1869 served as state senator; a member of the Tammany Society for many years, he became grand sachein in 1869-71. Having been appointed deputy street commissioner in 1863, when that department was changed to the department of public works, he was

at its head, a position which enabled him to initiate, as is generally believed, the formation of the combination known as the "Tammany ring," though by many it is claimed that the actual leader in this movement was Peter B. Sweeney, city chamberlain. A system of "raising" the amounts of vouchers for city and county work was arranged by those who were in the "ring," and thus enormous sums were stolen, which were divided among them. The power gained by the possession and use of so much money was employed to facilitate the operations of the "ring," and to prevent its members from being brought to justice. Legislatures and judges were bribed; and bills passed and decisions rendered in their favor. Gigantic schemes of city improvement were organized and carried out successfully. Fraudulent bills were audited, and their sum divided among the thieves. No such complete plan of public spoliation was ever devised and executed before in any country. The exposure of this vast system of speculation was made through the columns of the N. Y. Times, through the intervention of a disappointed enemy of the "ring;" and Tweed was indicted in 1872 for forgery and grand larceny. Two trials were held, and he was convicted on 51 counts, and sentenced to 12 years' confinement in the penitentiary, and to pay a fine of \$12,300.18; one year for each of 12 counts in the indictment; and a fine of \$250 each for 39 other counts. He was confined on Blackwell's Island from Nov., 1873, until June, 1875, when he was released by a decision of the court of appeals, on a legal technicality. He was immediately arrested on a warrant issued in a civil suit for \$6,198,957.85, and sent to Ludlow Street jail. Being permitted to go out to drive with an officer, he made his escape while paying a visit to his wife in Fifth Avenue, and successfully fled the country and went to Spain. He was caught and returned in Nov., 1876, and again incarcerated in Ludlow Street Jail until April 12, 1878, when he died.

TWEED MOUTH. See BERWICK-ON-TWEED.

TWEEDS, a name originally given to a certain kind of woolen cloth, produced in the s. of Scotland, largely made at Galashiels, Hawick, Selkirk, Jedburgh, and other places on the Tweed and its tributaries. It is prepared chiefly for men's apparel, but its use and consumption for women's wear has of late been steadily on the increase. It is of an open, soft, flexible nature; differing from English superfine cloth in not being so finely spun or closely woven, and most of all in not being so thoroughly felted. The fabric of broadcloth is not intended to show any appearance of weaving, whereas in tweeds, starting from the "shepherd's plaid," the whole art of weaving is capable of being developed in novel and fanciful designs, admitting of great variety of texture. Tweeds are further characterized by their purity of color and genuineness of make—shoddy, mungo, and cotton-warp not being yet used in the production of even the cheaper kinds. It is a manufacture of comparatively recent date. Seventy-five years ago, Galashiels, a principal seat of the manufacture, was only a small village; its few weavers individually manufacturing a species of coarse woolen cloth called "Galashiels gray," made from wool grown on the surrounding hills. About forty years later the fabric was so far improved, that its use was no longer confined to the border shepherds, but it had begun to be more or less worn by all classes in towns. The warmth, comfort, and durability of tweeds, as well as their suitability for all seasons, gradually led to their being preferred to the hard tartans, Manchester linens, and nankeens of former days; and eventually even to English doeskins. The demand for them rapidly increased. Galashiels has become a considerable town, and many large mills are now in active operation on the Tweed and its "waters," although they have for many years ceased to furnish power enough for the machinery. Nor has the manufacture confined itself to Tweedside, but has spread northward to Aberdeen, Elgin, and Inverness; and southward to Dumfries, and into Cumberland. The wools used in the production of tweeds are principally Cheviot, South American, and Danish for the coarser kinds; and Australian, New Zealand, and Saxony for the better qualities. The processes of spinning and weaving are similar to those adopted for English woolen cloth, the machinery, in fact, being, in the main, exactly the same.

TWELFTH-DAY. See BEAN-KING'S FESTIVAL, and EPIPHANY.

TWELVE APOSTLES, TEACHING OF THE. See TEACHING OF THE, etc.

TWELVE TABLES (Lat. *Lex* or *Leges Duodecim Tabularum*) the name given to the earliest code of Roman law. According to the ancient account, the code originated in this wise: In the year 462 B.C., a tribune, C. Terentilius Arsa, brought forward a proposal to appoint five men to draw up a set of laws, with the view of limiting the *imperium* of the consuls. The aristocracy, always furious, selfish, and unwise in their struggles with the commons of Rome, violently resisted this reform, and for eight years a fierce parliamentary warfare—if we may so call it—was carried on between the two orders, which ended in a sort of partial victory for the plebeians; that is to say, in 454 B.C., the senate assented to a *plebiscitum* (see PLEBISCITE), in virtue of which three commissioners were dispatched to Greece to report on the laws in force among the different states there. After a lapse of two years they returned; and it was then agreed that ten men (*decemviri*) should be selected to draw up a code (*legibus scribundis*); but the patrician or aristocratic party took care that these decemvirs should all be chosen from their body. The story of the political fortunes of the decemviri (q.v.), and of the

fate of the leading decemvir, Appius Claudius (q.v.), are well known, though we believe that it has not come down to us in a very historical dress; indeed, it is politically quite unintelligible in the main. But what concerns us here is not the political career of these men, but the character of the legislation ascribed to them. We say ascribed to them, for the whole story of the foreign travels of the commissioners, and of their eclectic procedure in the matter of the Solonian and other laws, is so completely at variance with the simple, narrow, *home-centered* feelings of the Roman people at that early time, and with the thoroughly *Italian* stamp of the legislation embodied in the "twelve tables," that it has very reasonably been doubted whether such a commission ever existed, or, if it did, whether it did not acquire its information from the Hellenic cities of lower Italy. Niebuhr, however, thinks the embassy to Greece just possible, though he is obviously reluctant to go further, and affirm that it really did occur (*Lect. Rom. Hist.*, vol. i. p. 296), and points out very clearly the difference between the Roman and Greek laws. "All," says he, "that is distinctive in the Roman law, is not to be found in the Athenian; and distinctive it is with regard to the rights of persons and things. Never had the Greeks the right of paternal authority, like the Romans; never the law, that the wife, by her marriage, entered into the relation of a daughter and co-heiress; never the *jus mancipii*, the formality in the purchase. The difference between property by formal purchase and simple property, between property and hereditary possession, does not exist in the Attic law; the Roman law of inheritance, the Roman law of debt, the Roman system in contacts of borrowing and lending, are quite foreign to the Athenians" (*Lect. Rom. Hist.*, vol. i. pp. 295, 296). These differences, and the number could easily be enlarged, have induced modern historians to adopt the theory—if, indeed, that should be called a "theory" which, in the eyes of all sound investigators, is a demonstrated fact—viz., that the twelve tables, instead of being an eclectic assortment of foreign laws, hitherto unknown to the people of Rome, and imposed on them for the first time, really expressed the first effort toward the codification of the consuetudinary law of the Latin race.

According to Livy (iii. 57) and Diodorus (xii. 56), the laws of the twelve tables were cut on bronze tablets (whence their name), and put up in a public place. Whether these tablets were destroyed by the Gauls when they sacked and burned Rome (390 B.C.) is uncertain. At all events, the later Romans entertained no doubt that the collection which existed in their time was genuine. The only portions extant are those which have been quoted by jurists and others. The twelve tables is described by Livy (iii. 34) as the *fons publici privatique juris*—the fountain of public and private law. Cicero (*de Or.* i. 43, 44) speaks of them with high praise. In the course of years, the *jus publicum*, as could not fail to be the case, was greatly changed, but the *jus privatum* of the twelve tables continued the fundamental law of the Roman state. See George Long's article "Lex," in Smith's *Dic. of Gr. and Rom. Ant.*; Niebuhr's *Lect. Rom. Hist.* (English translation, vol. i. pp. 295-319), Mommsen's *Hist. of Rome* (English translation, vol. i. book i. chap. 11, and book ii. chap. 2). The most complete essay on the history of the extant fragments of the twelve tables is to be found in Dirksen's *Uebersicht der bisherigen Versuche zur Kritik, und Herstellung des Textes der Zwölf-Tafel-Fragmente* (Leip. 1824).

TWESTEN, AUGUST DETLEV CHRISTIAN, D.D., 1789-1876; studied at Kiel; professor of theology at Kiel, 1814; succeeded Schleiermacher at Berlin, whose views he had adopted, 1835; was a member of the new supreme ecclesiastical council of the united evangelical church, 1850. He published *Vorlesungen über die Dogmatik der evangelisch-lutherischen Kirche* (1826); *Grundriss der analytischen Logik* (1834); *Matthias Flacius Illyricus* (1844); and edited Schleiermacher's *Ethik*.

TWESTEN, KARL, 1820-70; b. Kiel, Germany; son of August; educated at the universities of Berlin and Heidelberg. He was connected with the Prussian judicial services, became a leader in the progressive or liberal party, and in 1861 was elected to the chamber of deputies, and later a member of the North-German *reichstag*. He was the author of *Schiller in seinem Verhältnisse zur Wissenschaft* (1863); *Macchiavelli* (1868); and *Die religiösen, politischen, und socialen Ideen der Asiatischen Kulturvölker und der Aegypter in ihrer historischen Entwicklung* (1872).

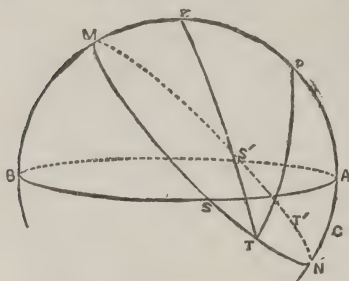
TWICKENHAM, a village in England, county of Middlesex, on the left bank of the Thames; pop. '91, 16,026. It is connected with Richmond on the opposite bank by a substantial bridge, and is 10 m. s.w. of St. Paul's, London. It contains the great church of St. Stephen's, completed in 1874; the estate of Alexander Pope, where the grotto is all that remains; his monument is in the church. At a little distance is the home of Walpole, called Strawberry hill; and the Orleans house, temporarily occupied by Louis Philippe and still owned by his descendants.

TWIGGS, a co. in central Georgia, 376 sq.m.; pop. '90, 8195, chiefly of American birth, with colored. Co. seat, Jeffersonville.

TWIGGS, DAVID EMANUEL, 1790-1862; b. Ga.; son of Gen. John Twiggs, a revolutionary officer. He served in the war of 1812, rose through successive grades to brig. gen., 1846, and commanded the right wing in the battle of Palo Alto and Resaca de la Palma in the Mexican war; brevetted maj. gen. for gallantry, at Monterey, 1848; presented with a

sword by congress. In 1848 he was appointed military and civil governor of Vera Cruz; dismissed the service in 1861, for surrendering troops and munitions of war to the state of Texas, which had seceded. His brother Levi was killed at the battle of Chapultepec in 1847.

TWILIGHT. If the earth had no atmosphere, we should be involved in total darkness from the instant of sunset till the instant of sunrise. The transition from day to night and from night to day, occupies an interval which varies with the latitude and the declination of the sun, and this intermediate stage is called twilight. As long as the sun is not more than 18° below the horizon, its light is reflected by the air and the clouds and vapors suspended in it, in sufficient quantity to render even distant objects visible. The question of the duration of twilight is, therefore, simply reduced to this: How long, after sunset, or before sunrise, does the sun reach a position 18° below the horizon of a given place? And this can be answered easily by calculation in spherical



trigonometry. Thus, if Z be the zenith, P the pole of the heavens, ASB the horizon, and $MSTN$ the (small) circle which the sun describes about the pole; there is twilight while the sun moves from T to S , ZT being an arc of 108° . In the spherical triangle ZPT , we know the three sides, for ZP is the colatitude of the place, PT the sun's polar distance, and ZT is 108° . Hence we can calculate the angle ZPT , which is the sun's *hour-angle*; and from this we find at once how long before or after noon the sun passes the point T . If ZT' be also 108° , we see that it is night while the sun moves from T' to T , day while it moves from S (through M , its meridian position) to S' , morning twilight from T to S , and evening twilight from S' to T' . Make $ZC = 108^\circ$, then, if PN be less than PC , but greater than PA , there will be no point of the sun's path ($MS'NS$) so far as 108° from Z ; and therefore the points T and T' will not exist. In this case the sun will set and rise, but there will be *no night*, or, rather, twilight will occupy the whole interval from sunset to sunrise. This cannot occur in low latitudes, but does occur during certain periods of the year in northern and southern countries. For

PN is 90° —sun's declination,
 PC is latitude $+ 18^\circ$,

and our condition is, therefore, that 90° —sun's declination, while greater than the latitude, does not exceed it by more than 18° . Or, in a simpler form, the latitude, together with the sun's declination, must lie between 90° and 72° . Now the sun's greatest declination is about $23^\circ 30'$, and therefore, in lat. $48^\circ 30'$ (72° to $23^\circ 30'$), there will be one night in the year (at the summer solstice) consisting wholly of twilight; for higher latitudes, more; and for lower none. Some curious problems on this subject, such as the finding the time of year at which the twilight is longest in a given latitude, were among the early triumphs of the differential calculus. A curious phenomenon, known as the *afterglow*, or second twilight, often seen in the Nubian desert, is referred by sir John Herschel to a second reflection of solar light in the atmosphere. Lambert and others had previously speculated on the possibility of second and even third twilights, but in their time there was no recorded observation of such appearances.

TWILL, a woven fabric, in which the warp is raised one thread and depressed two or more threads for the passage of the weft: this gives the structure a curious appearance of diagonal lines.

TWIN-SCREW (*nautical*). A pair of screw propellers on separate shafting, and built to work *right* and *left* respectively. The object of the right and left motion is to counteract the tendency to produce lateral vibration. The credit of the invention is due to Col. John Stevens, of Hoboken, N. J., who constructed, in 1804, a boat, fifty feet in length, which worked successfully, and the machinery of which is still preserved in the Stevens Institute of Technology, at Hoboken, N. J. As a test of the workings of the machinery, it was in the year 1844 placed in a vessel built on a model of the one in which it was first used, and successfully propelled at a speed of 8 miles an hour. The screws were placed one on either side of the rudder, and were driven by the same engine.

The principal ocean steamers at present thus fitted are the *City of Paris* and the *City of New York*, of the Inman line; the *Majestic* and *Teutonic*, of the White Star line; and the *Augusta Victoria*, *Columbia*, and *Normannia*, of the Hamburg-American line, with others building. The great benefit gained is that if one set of machinery is disabled, the other acting independently, will still propel the ship while repairs are being made, and thus avoid disaster, while, when both are in working order, there will be a very material addition to the speed of the steamer. See STEAM-NAVIGATION.

TWO MOUNTAINS, a co. of s.w. Quebec, having the Ottawa river for its s. boundary; 258 sq. m.; pop. '91, 15,027. Co. seat, Ste. Scholastique.

TYBEE, an island and sound at the mouth of the Savannah river, Ga. The sound is a bay of the Atlantic, extending from Tybee island on the s. to Hilton Head on the n., opening to Port Royal entrance by Cooper's river, Wall's, cut, Lazaretto creek, and other channels. The island is 6 m. long by 3 wide; and was occupied in 1861 by Gen. Gillmore, who erected batteries for the reduction of Fort Pulaski, which capitulated April 11, 1862.

TYBURN, previously to 1783, the chief place of execution in London, was situated near the n.e. corner of Hyde park, at the western extremity of Oxford street, and at the point where the Edgware and Uxbridge roads unite. It took its name from a small stream which ran from Hampstead to the Thames through St. James's park, but which has long since disappeared. The gallows seems to have been a permanent erection, resting on three posts, whence the phrase "Tyburn's triple tree." Wooden galleries were erected near it for the accommodation of spectators. Hogarth's *Idle Apprentice* was executed at Tyburn; and the print which represents the scene, gives a good idea of an execution there. The criminal was conveyed all the way from Newgate to Tyburn, a distance of about 2 m., by Holborn and the Tyburn road, now Oxford street, but in the 17th c. a "sloughy country road." As Oxford street and London generally spread westward, the long procession became inconvenient, and the place of execution was, on Dec. 9, 1783, removed to the Old Bailey, or Newgate, where it has since remained.

In early times, the frequency of executions rendered the office of hangman more important than it has since become. Throughout the reign of Henry VIII. (38 years), the average number of persons executed in England was 2,000 annually. In our own time, the corresponding number has sunk to twelve. Formerly, the hangman must have had almost daily work. This fact, taken in connection with the increase of population, and the employment of the Tyburn hangman in state executions, explains the important place he occupied in popular imagination, and the frequent mention of him in contemporary literature. The first on record was "one Bull," who flourished in 1593. He was succeeded by Derrick, referred to in the *Fortunes of Nigel*, and mentioned in a political broadside as living in 1647. In the ballad of *The Penitent Tailor*, published in the same year, reference is made to his successor, Gregory Brandon—

I had been better to have lived in beggary,
Than to have fallen into the hands of Gregory.

In Gregory's time, it became the custom to prefix "squire" to the names of the Tyburn hangmen. This is said to have originated in a practical joke played upon the Garter King-of-arms. He was induced to certify the authenticity of a coat-of-arms of a gentleman named Gregory Brandon, who was supposed to reside in Spain, but who turned out to be the hangman. The Garter King was committed to prison for his negligence, and hence the popular error, that "an executioner who has beheaded a state prisoner becomes an esquire." Gregory was succeeded by his son Richard. "Squire Dun" followed; and after him came Jack Ketch, or squire Ketch, first mentioned in 1678. He was the executioner who beheaded lord Russell and the duke of Monmouth. Lord Macaulay, in speaking of the execution of the latter, says: "He then accosted Jack Ketch, the executioner, a wretch whose name has, during a century and a half, been vulgarly given to all who have succeeded him in his odious office. 'Here,' said the duke, 'are six guineas for you. Do not hack me, as you did my lord Russell. I have heard that you struck him three or four times. My servant will give you some gold, if you do the work well.'" —See *History of England*, vol. ii. p. 205. What followed, it is needless to repeat. After this time, the "kings of Tyburn" all received the name of Ketch, and their patronymics seem to have been less noted. Jack Ketch's immediate successor was "one Rose, a butcher," and the last of the Tyburn hangmen was Edward Dennis, condemned for taking part in the no-Popery riots, but respited, it is believed, on the ground that his services could be ill dispensed with.

Among the most memorable executions at Tyburn were those of Elizabeth Barton, the holy maid of Kent, and her confederates (1534); John Felton, the murderer of the duke of Buckingham (1628); Jack Sheppard, the highwayman (1724); Jonathan Wild, the thief catcher (1725); Mrs. Brownrigg, the murderer of an apprentice (1766); Dr. Dodd (q.v.), found guilty of forging a bond for £4200 (1777); and the Rev. Henry Hackman, murderer of Miss Reay (1779). The associations connected with Tyburn have naturally led to the suppression of the name in the street nomenclature of London, but it survives in that given to the quarter of the metropolis described by Mr. Thackeray as "the elegant, the prosperous, the polite Tyburnia, the most respectable district in the habitable globe."

Under a statute of William III. (10 and 11, c. 23, s. 2), prosecutors who secured a capital conviction against a criminal were exempted from all manner of parish and ward "offices within the parish in which the felony had been committed." Such persons obtained what was called a "Tyburn ticket," which was enrolled with the clerk of the peace, and sold like any other property. The privilege the tickets conferred must have been highly valued, as they sold at a high price. "Last week," says the *Stamford Mercury* of March 27, 1818, "a Tyburn ticket sold in Manchester for £280." The act under which they were granted was, however, repealed a few months later, by 53 Geo. III. c. 70, passed June 3, 1818; and since then they have ceased to be recognized.

TYCOON, SHOGON, or SHOGUN, the title of the hereditary military ruler of Japan, formerly regarded as emperor. The office has been abolished since the revolution in favor of the "mikado," or spiritual ruler. The tycoon had his court at Yedo, now Tokio, and was the highest authority known to *foreigners*, though not in fact the chief ruler. The treaties which admitted foreign commerce and residents to Japan were negotiated with him. See JAPAN.

TYE, CHRISTOPHER, an English musician of note of the 16th century. He was b. at Westminster in 1500, educated in the king's chapel, and held the office of musical instructor to Edward VI. when prince of Wales. He received the degree of musical doctor from the university of Cambridge in 1545, and from Oxford in 1548. Under Elizabeth, he was organist to the chapel royal, and produced various services and anthems, some of which are yet in repute among musicians. Dr. Tye's general scholarship was considerable.

TYLDESLEY, a well-built and increasing town of Lancashire, England. Pop. '91, 12,891.

TYLER, a co. in e. Texas, having the Neches river for its e. boundary; 930 sq.m.; pop. '90, 10,877. Co. seat, Woodville.

TYLER, a co. in n. W. Virginia, having the Ohio river on the n.w.; 330 sq.m.; pop. '90, 11,962. Co. seat, Middlebourne.

TYLER, BENNET, D.D., 1783-1858; b. Conn.; graduated Yale college, 1804; ordained pastor of Congregational church, South Britain, Conn., 1808; president of Dartmouth college, 1822-28; pastor of Second church, Portland, Me., 1828-33. Advocating the "older" theology, he was the prominent opponent of Dr. Taylor's views on the nature of sin and the government of God; and the controversy led to the formation of a theological seminary at East Windsor, of which Dr. Tyler was president and professor of theology. The fierce theological debate lingers now only in faint echoes. He published *History of the New Haven Theology*; *Memoir of Rev. Asahel Nettleton*; *Review of Day on the Will*; *Treatise on the Sufferings of Christ*; *Letters to Dr. H. Bushnell on Christian Nurture*.

TYLER, MOSES COIT, b. Conn., 1835; educated at Yale college and Andover theological seminary. He was settled over a Congregational church in Poughkeepsie, N. Y., 1860-62, when he left the ministry on account of ill-health. He lived in England 1863-67, and then became professor of English literature in Michigan university. He afterwards entered the Episcopal church. He has published the *Brownville Papers*, an edition of Morley's *English Literature*, a *Life of Patrick Henry*, *Three Men of Letters*, *Literary History of the American Revolution*, and *History of American Literature during the Colonial Time* (1897). In 1881 he was appointed professor of history at Cornell university.

TYLER, ROBERT OGDEN, 1831-74; b. N. Y.; graduated West Point, 1853; commissioned in the artillery. He served on the border and as col. of volunteers through the peninsular campaign, and held important commands at Chancellorsville and Fredericksburg. In the Richmond campaign and at Spottsylvania he commanded a division of heavy artillery, and at Cold Harbor was wounded. He retired in 1865 with the brevet rank of brigadier-general.

TYLER, ROYALL, 1757-1826; b. Vt.; educated at Harvard college; read law with John Adams, and was for a time aid to Gen. Lincoln, serving in Shays' rebellion. He began to practice law in Vermont in 1790, and was chief justice of the supreme court of that state, 1800-6. He published in 1809 *Reports of Cases in the Supreme Court of Vermont*. He wrote several plays, and one of them, his comedy *The Contrast*, represented in New York in 1786, was the first American play produced by a regular dramatic company.

TYLER, SAMUEL, LL.D., b. Md., 1809; son of Grafton, a tobacco planter; fitted for college with Dr. Carnahan in his seminary at Georgetown; graduated at Middlebury college, Vt.; studied law at Frederick city, Md.; admitted to the bar, 1831. In 1844 he published a *Discourse of the Baconian Philosophy*; *Burns as a Poet and as a Man* (1848); articles and essays in the *Princeton Review*, 1836-59. He was appointed professor of law in Columbia university, Washington, D. C., 1867, and was appointed to simplify the pleadings and practice in the courts of Maryland. He d. 1878.

TYLER, WILLIAM SEYMOUR, D.D., b. Penn., 1810; educated at Amherst college. After being a teacher of the classics at Amherst academy, he graduated at Andover theological seminary and received a license to preach in 1836; but being called to the chair of Latin and Greek in Amherst college, was not ordained till 1858. In 1837 the professorship was divided and he took the chair of Greek, which he held until 1893. Among his numerous works are *The Germania and Agricola of Tacitus* (1847); *The Histories of Tacitus* (1848); *Plato's Apology and Crito* (1859); *Demosthenes de Corona* (1874); *The Olynthiacs and Philippics of Demosthenes* (1875); and a *History of Amherst College* (1895). His long and faithful service has given the college a high rank in his department. He died in 1897.

TYLER INSURRECTION. In 1381, during Richard II.'s minority, a poll tax of three groats was laid to defray the expenses of the war with France. This excited the common people to resistance. The people gathered from all parts of the realm, assembling at Blackheath under the conduct of two peasants, Wat Tyler and Jack Straw, "professing themselves," says Hollinshed, "to be zealous of truth and justice, and not thieves or robbers." The king, finding it vain to resist, promised a general pardon, freedom of commerce, and the abolition of villeinage. Meantime, a party of insurgents broke into the Tower, and killed the primate and chancellor and the treasurer. The king, meeting Wat at the head of the rioters in Smithfield, invited him to a conference, where he was perfidiously slain in the king's presence by William Walworth, mayor of London, who was incensed at Wat's fearlessness. The revolt was not extinguished without considerable bloodshed, but its effects were beneficial in giving an impetus to popular rights and ensuring the destruction of villeinage.

TYLER, JOHN, tenth president of the United States; was b. in Charles City co., Va., Mar. 29, 1790. His father, of the same name, was speaker of the house of delegates, gov. of Virginia, and a leading patriot of the revolution. John entered William and Mary coll. at 12, was admitted to the bar at 19, and almost immediately entered upon a large practice. At 21 he was elected to the state legislature, supporting the policy of Jefferson, Madison, and the democratic party. He was almost unanimously elected five times, and in 1816 he entered congress, where he took a leading part in the debates. During his long congressional career, he sustained all the measures of the state-rights party. In 1825 he was elected gov. of Virginia, and in 1827 senator in congress. He supported Gen. Jackson as a choice of evils, but condemned his proclamation against South Carolina, though equally disapproving of the principle of nullification. At a later day, in 1833-34, he made a report in which he censured Gen. Jackson for removing the deposits from the U. S. bank. When the whig party was formed, in 1834, he became one of its leading members, in opposition to executive despotism as exercised by Gen. Jackson. He was nominated for the vice-presidency in 1835 and again in 1840, when he was elected with Gen. Harrison. President Harrison died Apr. 4, 1841, a month after his inauguration, by which event Mr. Tyler became president. Unfortunately, he experienced the opposition of Clay, who proposed the scheme of a U. S. bank—a measure carefully eschewed by the whigs in the canvass, and to which both Gen. Harrison and Mr. Tyler had ever stood opposed. Mr. Tyler vetoed Clay's bills, and at his dictation all the cabinet save Webster resigned. The most important acts of his administration were the Ashburton treaty, by which several dangerous questions were settled with Great Britain, and the annexation of Texas, which opened up the great west to American enterprise. There was but one defaulter—and he for a very small sum—during his administration, while the expenses of the government were reduced one-sixth. At the close of his term of office he retired to private life until 1861, when he was pres. of a peace convention at Washington. Failing in his efforts at compromise, he gave his adhesion to the confederate cause, and was a member of the confederate congress until his death, at Richmond, Jan. 18, 1862. His life has been written by his son, Lyon G. Tyler, and is entitled *The Letters and Times of the Tylers*.

TYLOPHORA, a genus of plants of the natural order *asclepiadacea*, natives of the East Indies, New Holland, etc., with a wheel-shaped corolla, and a 5-leaved fleshy coronet. *T. asthmatica*, a native of the coast of Coromandel, has a high reputation, medicinally.

TYLOR, EDWARD BURNETT, LL.D., b. London, 1832; of a Quaker family; educated at Tottenham. He became a noted ethnologist and antiquarian, and in 1860 went to Mexico and there carried on extensive investigations of the religion, superstitions, social customs and manners of the natives, the results of which are given in *Anahuac, or Mexico and the Mexicans, Ancient and Modern* (1859). He has also written *Researches into the Early History of Mankind and Development of Civilization* (1865); and *Primitive Culture* (1871), *Anthropology* (1881). In 1891 he became president of the Anthropological society.

TYMPANUM (Lat. a drum), in anatomy, the middle ear (see EAR). In architecture, the flat space left within the sloping and horizontal cornices of the pediment of classical architecture, usually filled with sculpture (see GRECIAN ARCHITECTURE); also, the space between the arch and lintel of doorways in Gothic architecture, which is frequently enriched with sculpture.

TYNDALE, or TINDALE, WILLIAM, an eminent English reformer and martyr, well known as a translator of the Bible, was b. about 1484. He was educated first at Oxford, and afterward at Cambridge, and was, from his youth, as Foxe says, "singularly addicted to the study of the Scriptures." After leaving Cambridge, he became tutor and chaplain in the house of sir John Walsh, a knight of Gloucestershire, where he frequently engaged in religious disputes with the clerical dignitaries of the neighborhood, and soon incurred their wrath by what they deemed the heresy of his opinions. He went to London about the middle of 1523, bent upon the fulfillment of his long-cherished desire of translating the New Testament into English. Failing, however, to obtain the patronage he expected in carrying out this intention, he retired to Germany in 1524. Here his translation of the New Testament was published in 1525 or 1526, and conveyed into England. This work, although denounced by government, was yet so eagerly

received by the English, that several reprints of it were produced by the Dutch printers within the next few years. Tyndale continued on the continent, writing tracts in advocacy of the reformed doctrines; in 1520 he published a translation of the Pentateuch, and in 1531 one of the prophet Jonah. In 1533 he took up his abode in Antwerp, where, in 1534 and 1535, he published two revised editions of his New Testament. In 1535 he was treacherously arrested, and after a confinement of 16 months, was publicly strangled and burned as a heretic at Vilvorde near Brussels, in 1536.

Tyndale was a man of great learning as well as talent, and his own writings, in addition to his translations, show how well adapted he was for the great work of his life, so fearlessly carried out. Our modern version of the New Testament is substantially Tyndale's translation with modernized spelling. See *William Tyndale*, by Rev. R. De-maus, M.A. (1871).

TYNDALL, JOHN, physicist, was b. Aug. 21, 1820, at Leighlin Bridge, county Carlow. He had few educational advantages. On returning from the continent, where he received part of his education, he found employment in one of the subordinate grades of the ordnance survey. He was afterward appointed teacher of natural philosophy at Queenwood college, Stockbridge, and there commenced those original investigations which have distinguished him among the explorers of science.

In Jan., 1853, Tyndall communicated his first paper to the royal society, *On Molecular Influences—Transmission of Heat through Organic Structures*. It exhibits much of that skill in experimenting and fertility of resource which characterize his subsequent researches, and illustrates certain important questions in natural philosophy.

Year by year from the date above mentioned, Dr. Tyndall extended our knowledge of science. His field of research is wide and varied, as exemplified by the subjects of his papers published in the *Philosophical Transactions*—*On the Vibrations and Tones produced by the Contact of Bodies having Different Temperatures* (1854); *On the Physical Phenomena of Glaciers* (1857); *On some Physical Properties of Ice* (1858–59); *On Transmission of Heat through Gaseous Bodies* (1859); a series on *Radiation*, six papers (1861–65); *On Calorescence* (1865); *On the Invisible Radiation of the Electric Light* (1865). During the year 1867, he lectured on *Sounding and Sensitive Flames*.

In 1855, and again in 1861, Tyndall was appointed to deliver the Bakerian lecture to the Royal Society; the subjects were: *On the Nature of the Force by which Bodies are repelled from the Poles of a Magnet*; and *On the Absorption and Radiation of Heat by Gases and Vapors, and on the Physical Connection of Radiation, Absorption, and Conduction*, the latter being one of the series on *Radiation* above mentioned. The publication of this series of papers marks a period in the history of scientific research, for the facts therein set forth, and the conclusions drawn from them, demonstrate the relation of aqueous vapor to radiant heat, and elucidate certain meteorological phenomena which connect themselves with some of the profoundest and most interesting questions of cosmical science.

In 1864 the council of the Royal Society awarded to Tyndall their Rumford medal, in recognition of his scientific researches, particularly as bearing on light and heat. As a lecturer on scientific subjects, Tyndall enjoyed a high reputation. His lectures at the Royal Institution and the School of Mines were marked by great fullness of knowledge and clearness of illustration. Tyndall had experimented and written on the subject of germs, and on the acoustic transparency or cloudiness of the atmosphere.

In 1852, Tyndall was elected a fellow of the Royal Society. In 1858 he was appointed professor of natural philosophy in the Royal Institution, where, as successor to Davy and Faraday, he sustains the reputation of the place for original scientific research. His lectures at the School of Mines were attended by crowds of workmen. He was LL.D. of Cambridge, and a member of a number of the scientific societies of the continent. He was chosen president of the British Association in 1874. Besides his papers for the Royal Society, Tyndall also wrote articles in the *Philosophical Magazine* and *The Fortnightly Review*. His separate works comprise: *The Glaciers of the Alps, being a Narrative of Excursions and Events* (1860); *Mountaineering in 1861* (1862); *Heat considered as a Mode of Motion* (2d ed., 1865); *Radiation*, being the Rede lecture, delivered at Cambridge in 1865; *Lectures on Sound* (1867); a memoir of Prof. Faraday (1868); *Fragments of Science, and Hours of Exercise in the Alps* (1871); *Nine Lectures on Light* (1870); *Address delivered before the British Association in 1874, with Additions* (1874); and *Essays on the Floating Matter of the Air* (1881). He died Dec. 4, 1893.

TYNE, a river in the north of England, important from the enormously valuable mineral district through which it flows, and for the flourishing towns that line its banks, is formed by the confluence of two head-waters—the north Tyne and the south Tyne. The north Tyne rises on the Scottish border, 11 m. s.e. of Hawick. It flows s. across Keelder Moor, and s.e. to Hexham, after traversing a district abounding in picturesque villages and gentlemen's seats. Its chief affluent is the Reed, which rises on Carter Fell, and flows s.e. past Otterburn to Bellingham, where it joins the larger stream. Near Hexham, the north Tyne is joined by the south Tyne, which rises on the slopes of Cross Fell, 11 m. n. of Appleby, in Westmoreland, flows n. to Haltwhistle, and thence e. to Hexham, through a district crowded with old castles and peel-houses. From the junction of the two head-waters, the Tyne flows e. through the south of Northumberland,

which presents charming scenery, and is studded with castles and country seats. At Blaydon—about 8 m. above Newcastle—the navigation begins, and from this point, passing Newcastle (q. v.), Gateshead (q. v.), North and South Shields (see SHIELDS, NORTH, SOUTH), its banks are lined with foundries, furnaces, docks, wharves, and quays. It serves chiefly for the transport of coal. Total length, 80 miles. For the navigation of the river, see the chief towns near its mouth.

TYNEMOUTH, a small village and parish of Northumberland, takes its name from the river Tyne, on the north bank of which, and near its mouth, it stands. It is 8 m. e. of Newcastle by railway, and its light-house is in lat. $55^{\circ} 1' \text{ n.}$, long. $1^{\circ} 25' \text{ west.}$ Though itself only a village, it gives name to a township containing (1891) 46,267 inhabitants. Much of this township, however, is comprised in the town of North Shields (see SHIELDS, NORTH), and counts in the population of that town. It also gives name to a parliamentary and municipal borough, including besides the village of Tynemouth, the large town of North Shields, and the three villages of Chirton, Preston, and Cullercoats. The village of Tynemouth is much frequented as a watering-place by the inhabitants of Newcastle. Its sands, about a mile in length, form an excellent bathing-ground. There are many attractive buildings and institutions, as the castle and fortifications, the fine ruins of a priory and lady chapel, the master mariners' asylum, etc. The borough of Tynemouth sends one member to the house of commons.

TYNG, STEPHEN HIGGINSON, D.D., b. Mass., 1800; graduated, Harvard college, 1817; engaged in mercantile pursuits for 2 years; studied theology, and was ordained a minister of the Protestant Episcopal church, 1821; preached at Georgetown, D. C., 1821–23; at Queen Anne's parish, Prince George's co., Md., 1823–29; rector of St. Paul's church, Philadelphia, 1829; of the church of the Epiphany, 1833; of St. George's church, New York, 1845, which charge he resigned in 1879, having had for the 2 or 3 years previous the Rev. Dr. Williams as colleague. Dr. T. was a leading opponent of ritualism. He was widely noted for his fervid eloquence as a preacher, and he zealously advocated the temperance and other reforms. He has published *Lectures on the Law and the Gospel*; *The Israel of God*; *Christ is All*; *Christian Titles*; *Recollections of England*; *Sermons preached in the Church of the Epiphany*; *Family Commentary on the Four Gospels*; *Bible Companion*; *Forty Years' Experience in Sunday-Schools*; *The Spencers*; *The Prayer-Book Illustrated by Scripture*; *The Feast Enjoyed*. He edited the *Episcopal Recorder*; *Protestant Churchman*; *Theological Repository*. He d. 1885.

TYNG, STEPHEN HIGGINSON, JR., D.D., b. Philadelphia, 1839; graduated, Williams college, 1858; studied theology at the Virginia Episcopal seminary; ordained 1861; was assistant to his father in St. George's church for 2 years; rector of the church of the Mediator, New York, 1863; chaplain to the 12th New York volunteers, 1864; rector of the church of the Holy Trinity, New York, which he organized, 1865; resigning on account of impaired health in 1881, when he accepted the agency for a New York life insurance company in Paris. He edited, 1864–70, *The Working Church*, a weekly journal. He has shown rare gifts in the organization of various benevolent instrumentalities in connection with his church, which have accomplished an immense work of good.

TYPE, in theology, an image or representation of some object which is called the antitype. In theological use it is applied chiefly, although not exclusively, to those prophetic prefigurings of the persons and things of the new dispensation which are found in the ritual, and even in the history of the Old Testament. Under the heads HERMENEUTICS, EXEGESIS, have been explained the different senses of which the literal text of Scripture is considered susceptible. Of one of these, the "mystical," the "typical" sense forms a further subdivision. The word "type" itself is used as well by the writers of the New Testament (Acts, vii. 43; Romans, v. 14; Philippians, iii. 17) as by the Jewish historians, for instance, Philo, *Opp.* t. i. p. 108; and while St. Paul and other sacred writers speak of the ancient types of things to come, St. Peter completes the parallelism by describing baptism as the antitype of the ark of Noah, 1 Peter, iii. 21. Of the types of the Old Testament, many are directly pointed out as such in their very institution; many also are distinctly applied in the New Testament. There is a large class, however, which more properly fall under the mystical sense of Scripture, and which are called indirect, that is to say, "adaptive" or "applied" types. In the application and interpretation of these, many of the fathers, and especially Augustine and Gregory the great, are most elaborate and ingenious.

TYPE (Gr. *typos*, an impression or stamp), the name given to the stamps or dies which impress the letters on the paper in printing (q. v.). Printers, in early times, made the letters which they used, but in process of time the necessity for a division of labor created the distinct business of *type-founding*. There is evidence that, at the beginning of the 16th c., the apparatus for type-founding was much the same as up till near the middle of this century. The first step in the process is the cutting of a punch or die resembling the required letter. The punch is of hardened steel, with the figure of the letter cut, the reverse way, upon its point. On this die being finished, it is struck into a piece of copper about an inch and a quarter long, one-eighth of an inch deep, and of a width proportionate to the size of the type to be cast. This copper, being so impressed with the representation of the letter, requires to be adjusted to the mold, so that the "face" or impression of the punch (in the copper) may be brought into such relation with the metal which forms the

"body" or stalk of the type, that when the types are "set up" they may stand at the proper distance from each other, and be in "line" or range, and also square to the page; this work is termed "justifying," and the copper is now a "matrix." The matrix is now fixed into a small instrument or frame, called the mold, which is composed of two parts. The external surface is of wood, the internal of steel. At the top is a shelving orifice, into which the metal is poured. The space within is of the size of the required body of the letter, and is made exceedingly true. The melted metal, being poured into this space, sinks down to the bottom in the matrix, and, instantly cooling, the mold is opened, and the type is cast out by the workman. This process of casting types is executed with great celerity. Of course, every separate letter in the alphabet, every figure, point, or mark, must have its own punch and matrix. In casting types, the founder stands at a table, and has beside him a small furnace and pot with heated metal, which he lifts with a small ladle. *Type-metal* was a compound of lead and regulus and antimony, with a small proportion of tin; but in 1856 a new compound was formed by adding a *large* proportion of tin to the lead and antimony, which considerably increased the cost of the metal, but it doubled its durability. The antimony gives hardness and sharpness of edge to the composition, while the tin gives toughness and tenacity, and removes the brittleness which antimony causes when used largely without tin.

Various attempts were made during the early part of this century to cast type by machinery; but the first successful apparatus for this purpose was the invention of Elihu White of New York, which was modified and repeatedly improved upon by David Bruce, a Scotchman resident in America. The type-casting machine was introduced into Great Britain, and patented by Miller & Richard, of Edinburgh, in 1848. This machine, which requires a man to drive it, produces more than double the quantity that the hand-mold did, while the finish and regularity of the type so cast are much more perfect. Another machine was constructed and patented some years after by the same firm, with the view to apply steam for driving, which was successfully completed in 1860, and is now the most advanced and approved system of casting.

The type-casting machine consists, first, of a small melting-pot, which contains the molten metal, and is placed over a small furnace having an outer case of cast-iron. In the interior of the pot is arranged a forcing-pump and valve for admitting the metal under the piston, and also for preventing the return of the metal into the mass in the pot when the piston is depressed, and thus securing the full force exerted upon the piston being transmitted by the piston to the molten metal under it, and forcing it through a narrow channel leading from the bottom of the chamber in which the piston works to the outside of the pot, where a nipple is inserted, with a small hole through it, communicating with this narrow channel. Against this nipple, the mold in which the type is formed is pressed at the moment at which the piston descends, and so receives the molten metal that forms the type.

The second part of the machine is that which carries the mold, and to which the mold is firmly bolted. The mold is similar to the old hand-mold, but modified to suit the machine; it is much stronger; the "jets" are shorter, and the orifice by which the metal enters is smaller, so that it may be brought exactly coincident with the small hole in the nipple in front of the pot. The mold—as the old hand-mold—is made in halves; the one-half being firmly bolted to an arm which, by cams and levers, is made to oscillate, and carry the mold to and from the nipple in front of, and above the pot; the other half of the mold is bolted to another arm, which, by a peculiarly formed hinge, is attached to the first arm, so that the two halves of the mold may be made to open and shut upon each other like the lid of a snuff-box; and so both sides of the mold oscillate together to and from the nipple in the pot from which they receive the molten metal. The furnace, with the pot and machine carrying the mold, are raised upon cast-iron framing to a height convenient for a man standing to watch the working of the machine. The operation of the machine is as follows: The piston being raised in the chamber of the pump, and the chamber being supplied with metal through the valve, the mold is brought against the nipple; the valve closes to prevent the metal being forced back into the pot; the piston descends, and forces the metal through the narrow channel into the mold; the mold then recedes from the nipple, and in receding the two halves separate from each other and eject the type; the mold again approaches the nipple, and in approaching the two halves close together, and are ready for another operation.

A blast of cold air is directed upon each mold to keep it cool.

When the type is cast from the mold it is in a rough state, and as soon as a heap has accumulated on the caster's table they are removed by a boy, who breaks off a superfluous tag of metal, or "jet," hanging at the end of each type. From the breaking-off boy the types are removed to another place, where a boy rubs or smoothes their sides upon a stone. Being now well smoothed, they are next removed to a table and set up in long lines upon a "stick;" they are then dressed or finished, and, after being examined by a magnifying-glass, are ready for use. These different operations are now performed in a single machine which turns out perfect type which require no finishing. Whatever be the size of the types, they are all made of a uniform height, and must be perfectly true in their angles, otherwise it would be quite impossible to lock them together. A single irregular type would derange a whole page. All the types of one class of any founder are always uniform in size and height, and, to preserve their individuality, all

the letters, points, etc., belonging to one class, are distinguished by one or more notches or nicks on the body of the type, which range evenly when the types are set. These nicks, as we shall immediately see, are also exceedingly useful in guiding the hand of the compositor. Types are likewise all equally grooved in the bottom, to make them stand steadily.

The earliest types used were in the style known as Gothic or black-letter; which was afterward superseded, except in Germany, by the Roman letter. See BLACK-LETTER. The varieties of size of types in the present day amount to 40 or 50, enlarging by a progressive scale, from the minutest used in printing pocket-Bibles, to the largest which is seen in posting-bills on the streets. Printers have a distinct name for each size of letter, and use about 16 sizes in different descriptions of book-work; the smallest is called *brilliant*, the next *diamond*, and then follow in gradation upward, *pearl*, *ruby*, *nonpareil*, *emerald*, *minion*, *brevier* (the type with which this sheet is printed), *bourgeois*, *long primer*, *small pica*, *pica*, *English*, *great primer*, and *double pica*. The larger sizes generally take their names thus—*two-line pica*, *two-line English*, *four*, *six*, *eight*, or *ten line pica*, etc. Other nations designate many of these sizes by different names. Some of these names were given from the first maker; others from the books first printed with the particular letter. Thus, *Cicero* is the name of a type in France and Germany, with which Cicero's letters were first printed (Rome, 1467); *pica* is from the service of the mass, termed *pica* or *pic*; *primer*, from *Primarius*, the book of prayers to the Virgin; *brevier*, from *breviary*; *canon*, from the *canons* of the church, etc.

The following are the names of the sizes usually employed in the English language :

| | |
|------------------|----------------|
| 1—Brilliant, | International. |
| 2—Diamond, | International. |
| 3—Pearl, | International. |
| 4—agate or Ruby, | International. |
| 5—Nonpareil, | International. |
| 6—Minion, | International. |
| 7—Brevier, | International. |
| 8—Bourgeois, | International. |
| 9—Long Primer, | International. |
| 10—Small Pica, | International. |
| 11—Pica, | International. |
| 12—English, | International. |
| 13—Great Primer, | International. |

A complete assortment of types is called a *font*, which may be regulated to any extent. Every type-founder has a scale showing the proportional quantity of each letter required for a font; and a peculiar scale is required for every language. For the English language, the following is the type-founder's scale for the small letters of a font of types of a particular size and weight:

| | | | | | | | | | | | |
|---|--------|---|------|---|------|---|------|---|------|---|------|
| a | 8500 | f | 2500 | k | 800 | o | 8000 | s | 8000 | w | 2000 |
| b | 1600 | g | 1700 | l | 4000 | p | 1700 | t | 9000 | x | 400 |
| c | 3000 | h | 6400 | m | 2000 | q | 500 | u | 3400 | y | 2000 |
| d | 4400 | i | 8000 | n | 8000 | r | 6200 | v | 1200 | z | 200 |
| e | 12,000 | j | 400 | | | | | | | | |

Type-founding originated in Germany along with printing; as early as 1452, P. Schöffer (see GUTENBERG) had substituted types of cast-metal for the original wooden types. The earliest and best punch-cutters were in Nuremberg, which continued for a considerable time to supply the type-founders throughout Germany with punches. Bodoni (b. 1740, d. 1813) in Italy, the Didots (q.v.) in France, and Breilkopf (b. 1719, d. 1794) in Leipsic, are the most distinguished names in the subsequent history of type-making on the continent. The art made little progress in Great Britain from the time of Caxton, and the types used were mostly imported from Holland, until about the year 1720, when William Caslon, originally an engraver of ornamental devices, turned his attention to letter-cutting, and soon established such a reputation as to not only put a stop to the importation of foreign types, but caused his own to be frequently sent to continental countries. The foundry established by Caslon in London is still in existence.

Type-setting or "*Composing*."—All the types used in printing-offices are sorted in cases, or shallow boxes, with divisions. There are two kinds of cases—the *upper* and *lower case*; the latter lying nearest the compositor upon the frame for their support. The lower case is placed immediately under his hand, the upper case directly above in a slanting position, and the under part of the frame is stocked with cases of different fonts. (See illus., PRINTING, vol. XII., plate I., fig. 6.) In the upper case are placed all the capitals, small capitals, accented letters, a few of the points, and characters used as references to notes. In the lower case lie all the small letters, figures, the remainder of the points, and spaces to place between the words. In the lower, no alphabetical arrangement is preserved; each letter has a larger or a smaller box allotted to it, according as it is more or less frequently required; and all those letters most in request are placed at the nearest convenient distance to the compositor. By this ingenious and irregular division of the lower case much time is saved to the compositor, who requires

no label to direct him to the spot where lies the particular letter he wants. To a stranger nothing appears so remarkable as the rapidity with which a compositor does his work; but habit very soon leads the hand rapidly and mechanically to the letter required. When *italic* letters have to be introduced, they are taken from a separate pair of cases of the same font.

The process of composing and forming types into pages may now be adverted to. Placing the copy or manuscript before him on the upper case, and standing in front of the lower case, the compositor holds in his left hand what is termed a composing-stick. Sometimes this instrument is of wood, with a certain space cut in it of a particular width; sometimes of iron or brass, with a movable slide, which, by means of a screw, may be regulated to any width of line. (See *illus.*, PRINTING, vol. XII., plate I., fig. 7.) The composing-stick must be perfectly true and square. One by one, the compositor lifts and puts the letters of each word and sentence, and the appropriate points, into his stick, securing each with the thumb of his left hand, and placing them side by side from left to right along the line. When he places a letter in the stick he does not require to look whether he is placing it with the face in its proper position; his object is accomplished by looking at what is called the *nick*, which must be placed outward in his composing-stick. This is one of those beautiful, and at the same time simple, contrivances for saving labor which experience has introduced into every art, and which are as valuable for diminishing the cost of production as the more elaborate inventions of machinery. When he arrives at the end of his line, the compositor has a task to perform in which the carefulness of the workman is greatly exhibited. The first letter and the last must be at the extremities of the line: there must be no large spaces left in some instances, and crowding in others, as we see in the best manuscript. Each metal type is of a constant thickness, as far as regards that particular size of letter; though all the letters are not of the same thickness. The adjustments, therefore, to complete the line with a word, or at any rate with a syllable, must be made by varying the thickness of the spaces between the words. A good compositor's work is distinguished by uniformity of spacing; he will not allow the words to be very close together in some instances, and with a large gap between them in others, as is evident, for instance, in this sentence. In composing poetry, or similar matter, where there is always a blank space at one of the ends of the line, spacing is very easily accomplished by filling up the blank with larger spaces, or *quadrats*. But whether prose or poetry, the matter of each line must be equally adjusted and *justified*, so as to correspond in point of compactness with the previously set lines. The process of composing is greatly facilitated by the compositor using a thin slip of brass called a *setting-rule*, which he places in the composing-stick when he begins, and which, on a line being completed, he pulls out, and places upon the front of the line so completed, in order that the types he sets may not come in contact with the types behind them, but glide smoothly into their places to the bottom of the composing-stick.

When the workman has set up as many lines as his composing-stick will conveniently hold, he lifts them out by grasping them with the fingers of each hand, and thus taking them up as if they were a solid piece of metal. He then places the mass in an elongated board, termed a *galley*, which has a ledge on one or perhaps both sides. The facility with which some compositors can lift what is called a *handful* of movable type without deranging a single letter, is very remarkable. This sort of skill can only be attained by practice; and one of the severest mortifications which the printer's apprentice has to endure is to toil for an hour in picking up about a thousand letters, and then see the fabric destroyed by his own unskillfulness, leaving him to mourn over his heap of broken type, technically denominated *pt.* (See same *illus.*, fig. 8.)

Letter by letter, and word by word, is the composing-stick filled; and by the same progression the galley is filled by the contents of successive sticks. When the compositor has set up as many lines as fill a page he binds them tightly round with cord, and removes them from the galley.

Sometimes, as in the case of newspaper and similar work, the *handfuls* of type are accumulated till they fill the galley, and in that form are prepared for press. After the matter is thus far prepared, it is the duty of the pressman to take an impression or *first proof* from the types, in order that the first-proof *reader* may compare with "copy," or MS.; after which it is handed to the compositor, so that he may correct the errors which are sure to have been made. Proofs are usually taken by a press kept for the purpose. After the galley matter is corrected and re-corrected by the compositor, it is divided into pages of the size wanted; and head-lines and figures indicating the number of the page being added, the pages are arranged upon a large firm table, and there securely fixed up in an iron frame or *chase*, by means of slips of wood and wedges, or *quoins*.

This process, which is called *imposing*, being completed, and the face of the types being leveled by a *planer* and mallet, the *form*, as it is called, is proved, and prepared for press. Proof-sheets being taken, they are subjected to the scrutiny of a *reader* employed in this peculiar function in the office, the author himself having previously given effect to his corrections or emendations. When the *reader* has pointed out words and letters to be altered or corrected, the compositor once more goes over the form, correcting the errors by lifting out the letters with a bodkin, and, when revised, the sheet is pronounced ready for printing. The imposing-table at which all these corrections are made is usually composed of smooth stone, or marble, or cast-iron on the top, and requires to be a substantial fabric. See TYPE-SETTING MACHINES.

TYPES, CHEMICAL. The idea of referring organic bodies to some simple type or representative, has attracted the attention of many chemists, among whom Dumas, Sierry Hunt, Laurent, and Gerhardt, especially deserve notice. As our limited space prevents us from attempting to trace out the history of the theory, we shall confine ourselves to a statement of the outline of the doctrine as laid down by Gerhardt, and now adopted in most recent books on organic chemistry. The four principal types, to which most of the chemical compounds are referred, are the following: (1) The hydrogen or metallic type, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \}$; (2) The hydrochloric acid or chloride type, $\begin{smallmatrix} \text{H} \\ \text{Cl} \end{smallmatrix} \}$; (3) The water or

oxide type, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \}$ O; and (4) The ammonia or nitride type, $\begin{smallmatrix} \text{H} \\ \text{H} \\ \text{H} \end{smallmatrix} \}$ N.

1. The *hydrogen type*, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \}$, includes, according to Gerhardt, the radicals of the alcohols, marsh gas, and the hydrocarbons homologous with it, the aldehydes, etc. Thus,

methyl hydride (marsh gas), CH_4 , is written thus. $\begin{smallmatrix} \text{CH}_3 \\ \text{H} \end{smallmatrix} \}$;
and dimethyl (ethane), C_2H_6 , is written $\begin{smallmatrix} \text{CH}_3 \\ \text{CH}_3 \\ \text{CH}_3 \end{smallmatrix} \}$;
also acetyl hydride (aldehyde), $\text{C}_2\text{H}_4\text{O}$, may be written $\begin{smallmatrix} \text{CH}_3 \cdot \text{CO} \\ \text{H} \end{smallmatrix} \}$;
and acetyl methyl (acetone), $\text{C}_3\text{H}_6\text{O}$ $\begin{smallmatrix} \text{CH}_3 \cdot \text{CO} \\ \text{CH}_3 \end{smallmatrix} \}$.

Among the compounds of inorganic chemistry belonging to this type, Gerhardt places the hydrides, arsenides, and antimonides of the metals.

2. The *hydrochloric acid type*, $\begin{smallmatrix} \text{H} \\ \text{Cl} \end{smallmatrix} \}$, is removed by many chemists from the primary or principal types, and is regarded as a derived type from the preceding one, one equivalent of H being here replaced by one of chlorine. It includes the chlorides, fluorides, iodides, bromides, cyanides, the ethers of the hydracids, etc. As examples, we have:

ethyl chloride (hydrochloric ether), $\text{C}_2\text{H}_5\text{Cl}$, written $\begin{smallmatrix} \text{C}_2\text{H}_5 \\ \text{Cl} \end{smallmatrix} \}$;
acetyl chloride, written $\begin{smallmatrix} \text{CH}_3 \cdot \text{CO} \\ \text{Cl} \end{smallmatrix} \}$;
and benzoyl chloride $\begin{smallmatrix} \text{C}_6\text{H}_5 \cdot \text{CO} \\ \text{Cl} \end{smallmatrix} \}$;
also cyanogen chloride may be written $\begin{smallmatrix} \text{CN} \\ \text{Cl} \end{smallmatrix} \}$.

3. The *water type*, $\begin{smallmatrix} \text{H} \\ \text{H} \end{smallmatrix} \}$ O, includes the oxides (in which term are embraced acids, bases, and salts), the sulphides, the alcohols, the simple and compound ethers, the mono-basic organic acids, etc. The following are a few examples:

ethyl alcohol (common alcohol), $\text{C}_2\text{H}_5\text{O}$, written $\begin{smallmatrix} \text{C}_2\text{H}_5 \\ \text{H} \end{smallmatrix} \}$ O,
ethyl ether (common sulphuric ether) $(\text{C}_2\text{H}_5)_2\text{O}$ $\begin{smallmatrix} \text{C}_2\text{H}_5 \\ \text{C}_2\text{H}_5 \end{smallmatrix} \}$ O,
acetic acid, $\text{C}_2\text{H}_4\text{O}_2$ $\begin{smallmatrix} \text{CH}_3 \cdot \text{CO} \\ \text{H} \end{smallmatrix} \}$ O,
and acetic anhydride $(\text{C}_2\text{H}_5\text{O})_2\text{O}$, written $\begin{smallmatrix} \text{CH}_3 \cdot \text{CO} \\ \text{CH}_3 \cdot \text{CO} \end{smallmatrix} \}$ O.

4. The *ammonia type*, $\begin{smallmatrix} \text{H} \\ \text{H} \\ \text{H} \end{smallmatrix} \}$ N, includes the nitrides and phosphides, the compound ammonias, and the amides; as, for example,

ethylamine $\begin{smallmatrix} \text{C}_2\text{H}_5 \\ \text{H} \\ \text{H} \end{smallmatrix} \}$ N; acetamide $\begin{smallmatrix} \text{CH}_3 \cdot \text{CO} \\ \text{H} \\ \text{H} \end{smallmatrix} \}$ N,
diethylamine $\begin{smallmatrix} \text{C}_2\text{H}_5 \\ \text{C}_2\text{H}_5 \\ \text{H} \end{smallmatrix} \}$ N; benzamide $\begin{smallmatrix} \text{C}_6\text{H}_5 \cdot \text{CO} \\ \text{H} \\ \text{H} \end{smallmatrix} \}$ N,
triethylamine $\begin{smallmatrix} \text{C}_2\text{H}_5 \\ \text{C}_2\text{H}_5 \\ \text{C}_2\text{H}_5 \end{smallmatrix} \}$ N; and cyanamide $\begin{smallmatrix} \text{CN} \\ \text{H} \\ \text{H} \end{smallmatrix} \}$ N.

Besides these three or four principal types, there are *derived types*, *multiple types*, and *mixed types*; and under one or other of these types, primary and derived, multiple and mixed, all organic compounds can be arranged; and the theory of types leads to the general conclusion, that all organic compounds, or, more strictly speaking, their molecules, may be regarded as molecules of hydrogen, water, ammonia, hydrogen sulphide, etc., in which the hydrogen is entirely, or in part, replaced by organic radicals.—For further information on this subject, the reader is referred to Roscoe and Schorlemmer's *Treatise on Chemistry*, vol. iii., part 1, 1886, and to the second volume of Gorup Besanez,

Lehrbuch der Chemie, pp. 24-48. The chapter "On Types," from this volume, has been reprinted separately in the form of a pamphlet.

TYPE-SETTING MACHINES. There are few problems in mechanics that have been so persistently attacked by the inventor, and until recently with such indifferent results, as that of a successful T. S. M. The difficulties to be overcome are so numerous and so great that many have rightfully doubted whether any mechanism could be devised that would profitably supersede the old hand method of setting type. Stored away in many printing-offices and other places in this country are machines of which both inventors and printers had great hopes; hopes which have never been realized.

Inventions in this line are of the following classes:

1. Machines for simply composing ordinary type.
2. Matrix machines, or machines by which molds are set up, and from which metal printing plates are cast.
3. Machines for setting up lines of dies, which are immediately pressed into papier-mâché, wood, or other material, the material so impressed becoming a mold for the subsequent casting of a metal printing plate.

In England, as early as 1822, William Church, a Connecticut man, took out patents on a machine of the second class. Since that time Young, Delcambre, Hattersley, Fraser, and Mackie have brought out machines, some of which have been for a considerable time before the public; but all, for one reason or another, impracticable.

In our own country the inventor has been rather more successful, and the attention which the subject is just now receiving seems to indicate that at no distant day nearly all our newspaper and book composition will be effected by machinery. The *New York Tribune*, *Louisville Courier-Journal*, *Chicago News*, *Washington Post*, and *National Republican Critic*, were among the first newspapers to adopt the Linotype. It is now in general use in almost all large printing offices, and is the invention of one Ottmar Mergenthaler. This machine is of the second class above referred to, and takes its name from the fact that it sets up a line of molds, and casts a line of type, or rather a solid plate, being the same as if a line of type were fused into a solid. These molds or matrices are small pieces of sheet metal, each with a letter impressed on its edge. They are placed in magazine tubes, all the *a*'s in one tube, all the *b*'s in another, and so on, the tubes being arranged vertically in a continuous line. The machine has a key-board like a type-writer, and the depression of a key causes a matrix to drop into an inclined race, down which it is driven by a blast of air from right to left, where it takes its place in line. The spaces between words are simply duplex wedges, dropped into position the same as the matrices. When the compositor has set all that will go into a line, the duplex wedges are slid one upon another, thus "spacing out" the line, and from the line so formed, automatically, the line of type is cast, and its sides and base planed, after which it is deposited on a galley, the matrices meanwhile being released and passed overhead upon a distributing belt, whence they drop into their appropriate magazine tubes. Corrections, if any are needed, are usually made just after the line is assembled and before casting.

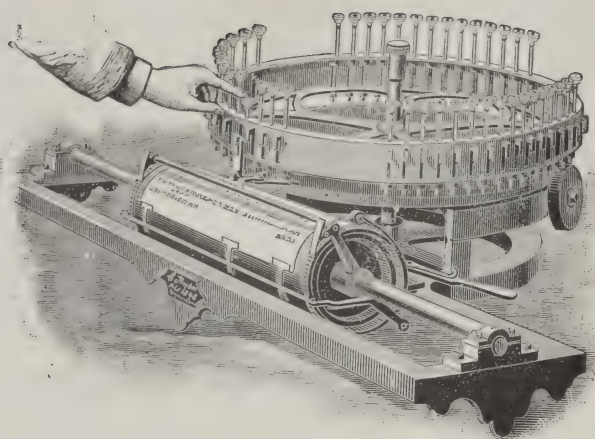
The advantages of this machine are, among others, that it gives constantly a new type-face to print from, and also that there is no distributing to be done, the plates being melted over. The "spacing out" device is another, and a very decided advantage.

Another machine which has stood very severe tests thus far is the invention of John L. McMillan, and belongs to the first class above referred to. For this machine the type is all arranged in brass cases, each case holding all *a*'s or *b*'s, etc. These cases are simply channels wide enough to admit of the free passage of the letter. The cases are held in the machine in a nearly horizontal position, in superposed tiers, and discharge their types into races that are parallel to the sides of the V-shaped case-frame, each race forming a confluence with a main vertical race. Each touch of a key discharges a type which gravitates to the point of formation of the line. The line so formed is met by a second operator, who divides it into lines of the required newspaper or book measure, and does the justifying. A careful estimate shows that on ordinary matter an operator will average about 41,000 ems per day. This will be understood as representing the labor of two men. A companion to this machine is the distributor, which consists of a nearly horizontal revolving disk, in the upper face of which are any number of radial channels, in which the lines of type are placed. Each type is differently "nicked," and as the disk revolves the letters are discharged into their appropriate cases.

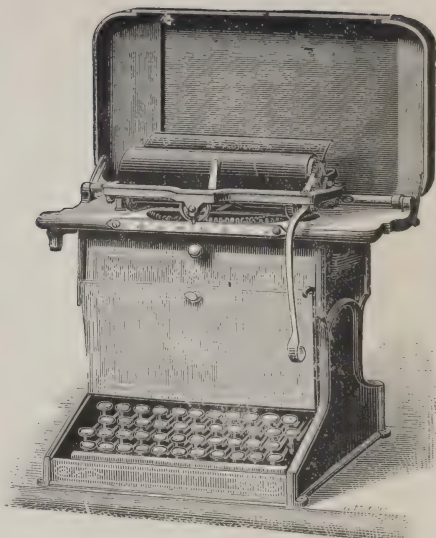
In addition to the above are the Burr machine and the Thorne machine, both of the first class, and both used to a limited extent in New York. The former of these is said to have made a very good record for itself, and that it has not come into more general use may be attributed, in some measure at least, to what has been hitherto an ultra-conservatism on the part of the craft.

A very ingenious type-setting machine is the Typotheter, the invention of Alexander Lagerman, a Swede, but practically an American product. The object of this machine is simply to facilitate the existing hand method of type-setting. The compositor throws the type into a funnel, and as it emerges at the bottom it is seized by a pair of fingers, and borne to its place in line. The wonderfully ingenious part of the mechanism is that no matter in what position the letter may be when seized, it will be turned over and upside down, if necessary, to bring it right, and is not turned at all if it does not need it. The advantage of this machine is that it enables the compositor to use both hands in picking up the type. As in other machines, a second operator does the justifying.

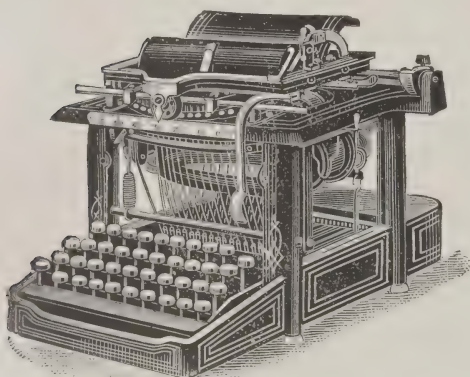
LIBRARY
UNIVERSITY OF ILLINOIS
CHAMPAIGN



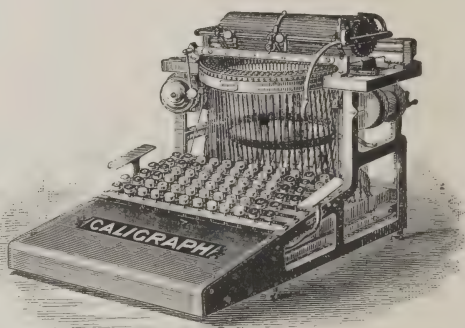
THE FIRST TYPEWRITER—THE THURBER.



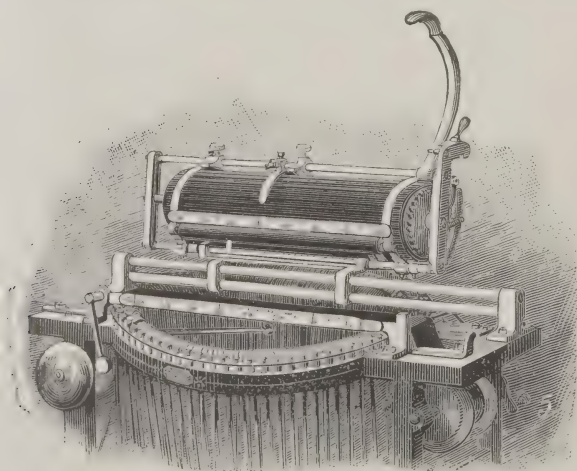
REMINGTON STANDARD—No. 1.



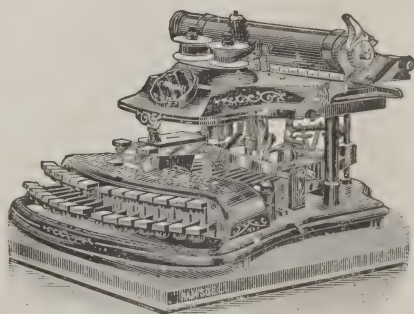
REMINGTON STANDARD—No. 2.



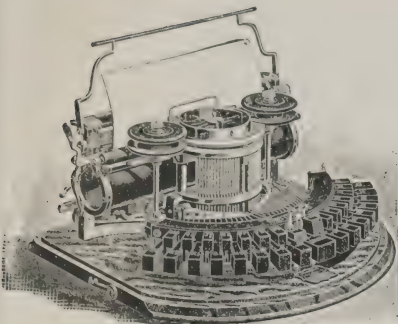
THE CALIGRAPH—No. 2.



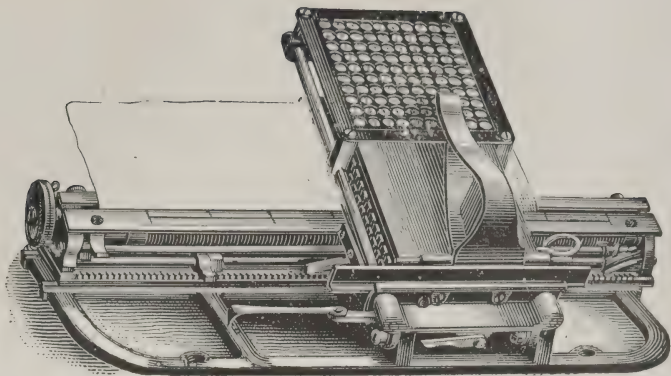
THE CALIGRAPH—showing Basket of Levers and Raised Carriage.



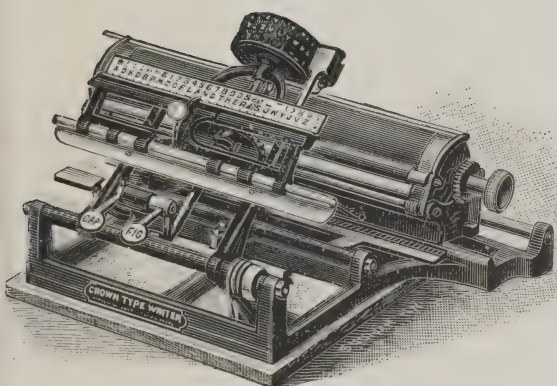
THE CRANDALL.



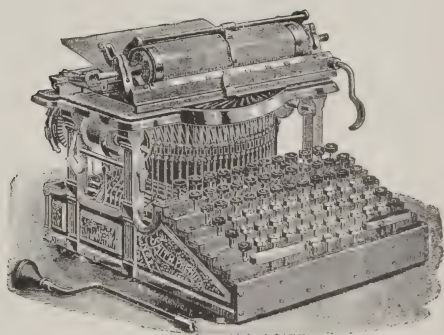
THE NEW HAMMOND.



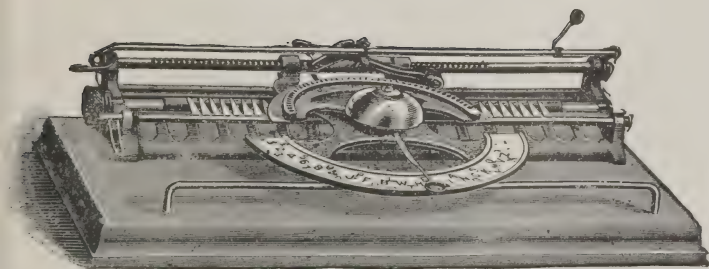
THE CENTURY, (New Hall).



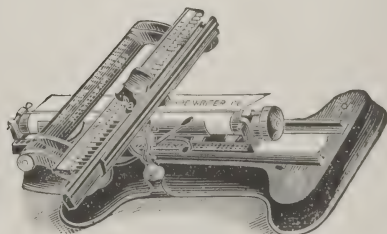
THE CROWN.



THE SMITH PREMIER.



THE WORLD.



THE SUN.

TERS.

1900
CITY OF ILLINOIS
URBANA

TYPE-WRITERS. The T.W., like the telegraph, the telephone, the sewing-machine, and many other equally important inventions, is purely an American product. It is true that the English inventor was first in the field, but his efforts do not seem to have been rewarded with success. As early as 1714 a patent was taken out in England by one Henry Mill for a type-writing device; but the invention appears never to have been perfected, and no further attempts by English inventors are recorded until 1841. Since that time there have been more than a hundred T.W. devices patented in England, but they all seem to have shared the fate of the Mill invention. The American inventor appears first to have turned his attention to this important subject in 1843; for in that year a patent was taken out by Charles Thurber, of Worcester, Mass. This is the first machine shown in our illustrations, and is simply an order of type-bars in a vertical position around a horizontal brass wheel, sixteen in. across, which revolves about a central post; the characters being brought into position by hand from either direction. Common types are inserted in the lower ends of the type-bars. This machine is still in existence. In 1856 Mr. A. E. Beach, who, as early as 1847, had constructed a fairly successful but never perfected T.W., took out a patent for a machine intended to print embossed letters for the blind. This is worthy of record, because it covered a principle afterwards developed into the modern T.W.—namely, a basket of levers arranged on a circle, so as to deliver their impressions on a common center.

In order to make raised letters there were two sets of bars, one coming up and the other down, one having a raised letter and the other, its mate, a sunken or intaglio letter. The strip of paper was grasped between the two. Beach was followed by S. W. Francis, who was the first to really complete a T.W. To the Beach principle of a circle of type-bars, Mr. Francis added the piano-forte action. Thomas Hall, the inventor of the present Hall T.W., had been experimenting with a T.W. apparatus at the same time that Beach and Francis were working, but it seems without any suspicion of them or their intentions. In 1859 he heard of these prior patents, and was compelled to negotiate for their purchase in order to make way for his own. The outbreak of the war seems to have put an end to Mr. Hall's experiments; but in 1867 they were renewed, and several of his machines were actually ordered by the departments at Washington. Although the machine embodied the principle of a circle of type-bars, yet their movement, instead of being from below upwards, was from above downwards, converging at a common center, an inked ribbon intervening between the type and the paper. But Mr. Hall was compelled to abandon his efforts without realizing his great expectations.

About this same time, 1867, Mr. Charles Latham Sholes, Samuel W. Soule, and Carlos Glidden, of Milwaukee, Wis., began to experiment on the construction of a T.W., and it was in their first arduous experiments, continued over many months, that the Remington T.W. of the present day had its origin. The first crude working model was completed in that year. Early in 1868 Soule and Glidden ceased their connection with the enterprise, and Sholes, encouraged by the suggestions and the financial aid of James Densmore, of Meadville, Pa., continued his experiments. Several machines were built, and sent here and there to be tested by practical stenographers. One after another these machines were thus demolished, until the patience of Mr. Sholes became nearly exhausted; but Densmore persisted that, as the machines were designed for popular use, none of these tests were too severe. In 1873 the machine was deemed sufficiently complete to justify arrangements for its general sale, and a contract was made by the T.W. company with E. Remington & Sons, of Ilion, N. Y., for its manufacture. During the year 1874, about four hundred machines were built and disposed of, being all of the pattern shown in our second illustration, now known as the Remington No. 1, and briefly described as follows: Pivoted about a horizontal ring are the type-bars, some thirty-eight in number, with steel types inserted in their lower ends, and so pivoted as to rise vertically to a common center. The short arms of these levers are connected by wire rods with the levers proceeding from the key-board. The paper to be printed passes around the rubber cylinder shown, and the lower side of this cylinder of course receives the impact of the types. An inked ribbon intervenes between the type and the paper. This ribbon, in the operation of the machine, is gradually unwound from a spool at one side of the machine to another on the other side, and when the spool is exhausted, the motion is reversed. With each release of a key by the finger of the operator, a ratchet movement at the back of the cylinder allows the carriage to move along one space, thus making room for the next letter. The tension is kept on the carriage by a coiled spring and strap. At the end of a line the carriage is drawn back to the starting-point by means of the arm seen depending in front, and the same movement turns the cylinder, and carries the paper to make ready for the following line.

In 1877 a very important improvement was introduced, whereby each type-bar in the circle was made to carry two characters and adjusted to separate common centers. By depressing a key, the carriage is thrown forward to the second center, which is adjusted to receive all the capital letters and many other characters. This double alphabet machine is known as the Remington No. 2, and in dimensions is fifteen in. on the side, twelve in. on the front, and nine in. in height, and weighs twenty-three lbs. It prints a line of six and one half in., ten letters to an in. The whole key-board covers a space of only eight by two and one half in., and the speed of the machine seems to be limited only by the capacity of the operator. In a speed contest held at Toronto, August 13, 1888, Miss

M. E. Orr wrote 987 words in ten minutes with a Remington No. 2, an average of nearly ninety-nine words per minute, exclusive of all errors. Mr. F. E. McGurrian followed with an average of ninety-five words per minute, and it would appear that the limit of speed on this machine has not yet been reached. We have been thus minute in describing this machine, because of the commanding position it has held in the market from the first.

The Remington may be regarded as the pioneer machine. The first to follow was the Caligraph, largely the invention of George W. N. Yost, whose attention had been closely directed to the Remington machine in the years between its invention and general sale. This machine, like the Remington, has the type-bar and pianoforte action, and in many respects closely resembles its rival. In this machine the so-called shift from capitals to small letters is done away with, and there is a separate lever and type-bar for each character. The horizontal levers with which the keys are connected are also hinged at the front instead of the back. The carriage is supported, and is adjusted much the same as in the Remington, but is actuated by a torsion spring about a rod extending from the front to the back of the machine frame, where a vertical arm connects with the carriage frame above. The cylinder has a polygonal surface, the impressions being received on the faces. This machine, like the Remington, by means of carbon paper between the sheets, will make from five to fifteen copies at one writing, according to the thickness of the paper. In the speed contest above referred to, Mr. F. W. Osborne wrote 935 words in ten minutes on the Caligraph.

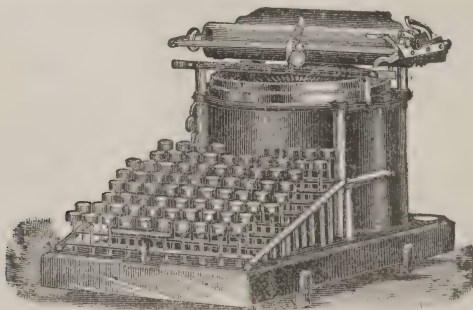
The Remington and the Caligraph were the earliest of the machines manufactured which embody the type-bar feature; but nearly every other known principle for bringing the letters to a common center has been utilized. In March, 1881, Thomas Hall, above referred to, took out a patent for a T.W. constructed upon an exceedingly interesting and novel principle. As shown in the illustration, there is a perforated dial plate two in. square, containing seventy-five characters. Underneath this dial plate in his latest machine, called the Century, is a rubber-faced cylinder with letters on its surface corresponding to those on the dial plate. When the stylus as shown is brought to any perforation in this dial plate, the cylinder beneath is turned to present the corresponding letter to the paper, and the stylus being pressed into the hole the letter is printed. The under cylinder revolves against an inked pad.

Prominently identified with the history of the T.W. is Mr. L. G. Crandall, the inventor of the machine which bears his name, and which was first brought out in 1875. This is a keyed instrument, but its action is wholly unlike that of the type-bar machine. In front of the rubber cylinder is erected a vertical post, and over this is slipped a sleeve, having on its surface eighty-four characters in parallel rows. Obedient to the pressure on the key, this sleeve rises or falls, twirls to the right or left, until the proper letter is brought in front of the paper, when it is tripped, delivering its blow with a hammer-like action against the paper, the inked ribbon intervening.

A machine with a good many claims to popular favor is the Hammond, the invention of James B. Hammond, and which has now been several years on the market. Its central principle is that of the type-wheel, a favorite device of John Pratt, an English inventor, who labored for a long time, but unsuccessfully, to make his invention a practical success. The operation of the machine can hardly be understood from the illustration. Within the cylindrical turret on the center is a horizontal type-wheel, the letters being on the ends of the spokes. As in the Crandall, a depression of the key raises or lowers this wheel, and twirls it about until the given letter is brought to face the paper. An impression hammer is then tripped from behind by the furthest depression of the key, driving the paper against the type, an inked ribbon intervening between type and paper. The work of this machine, in careful hands, shows great beauty and perfect alignment.

In addition to these larger and more expensive machines, and which are the T.W. used in business houses where the demands are the most exacting, there are several smaller T.W., such as the World, the Sun, the Columbia, the Crown, the Morris, and the Herrington, all of which have their more or less practical uses.

Improvements and alterations in type-writers and writing-machines are continually going on. Among the more recent are the following: The Yost Writing Machine, invented by Mr. G. W. N. Yost, the maker of the Caligraph already mentioned. This machine, of which a cut is subjoined, presents the following distinctive features: (1) a



THE YOST WRITING MACHINE.

double alphabet, capitals and small letters; (2) the absence of the inked ribbon, the printing being done directly from the type; and (3) the admirable centre-guide which gives a perfect alignment upon which wear produces no effect. Simplicity is sought and secured in every detail of this excellent instrument.

The Anderson Reporting Machine was patented in 1885 by Mr. George K. Anderson of Memphis, Tenn. This is a further development of a machine known as the Stenograph, the invention of Mr. M. Bartholomew, and patented in 1879. The Stenograph is a small machine, consisting of five writing keys, each carrying a "marker," and with a spacing key, an inked ribbon, a guide, etc. Four of the writing keys are V-shaped and one is straight. All the letters can be made with either hand. It does not print letters, but rather marks representing sound, and is intended for the use of stenographers. The Anderson machine, instead of marks, prints letters. It has 13 keys, five of which are struck by the thumb and fingers of the hand on either side, and two by the palms of the hands, while the dot is made by the thumb. The design is to write only the consonants of a word, and to indicate the class of the vowels on which the accent falls. To use the machine, it is essential to commit to memory 125 abbreviations and contractions which form a part of the system.

The Capital Type-Writer is the invention of Mr. C. T. Moore, of Washington, and was patented in 1890. Its distinctive features are: (1) an increase of possible speed over other instruments, secured by the device of a type-wheel, which revolves in one direction and allows the type-carrier to move from the letter printed to the character designated, while the operator's hand is passing to the succeeding key; (2) great clearness of impression; (3) the use of printers' type; and (4) the fact that the work is constantly before the eyes of the operator.

The Barlock Type-Writer, invented by Mr. Charles Spiro, is one in which the type-bar strikes downward. The blow is given on a cylinder over which an inked ribbon is imposed at the moment of impact, immediately disappearing so as to leave the whole line in plain sight. There is a double-bank key-board with a separate key for each character. A rubber band is fitted to the feeding bar so that the alignment, which is secured by an ingenious arrangement of bronze pins, is not disturbed.

The Crown Type-Writer of Mr. B. A. Brooks has a type-wheel set in a vibrating framework, with a letter-plate and finger-piece attached to a rack which rotates the shaft of the type-wheel in order to bring the character into position. The frame is then lowered by a lever worked with the left hand, so that the wheel strikes the paper on the top of a platen. The writing is always visible to the operator.

The Morris Type-Writer, invented by Mr. Robert Morris, uses 45 letters and characters, and allows the use of interchangeable styles on the same machine. The type is inked by a pad. The Smith-Premier is also a popular machine, and so of late is the Williams.

The Herrington, or "Pocket Type-writer" is a very small instrument, not weighing more than half a pound. It has 46 characters which are held in a wheel, and with it ordinary sized paper can be employed in writing. Apart from its smallness, its chief advantage is the facility with which it can be adjusted for use upon any part of the pages of a bound volume.

INKS FOR TYPE-WRITERS are usually colored with anilines and have a glycerine body. The ribbons for type-writers are prepared in all colors. Formerly some shade of purple was more popular, as being bright and clear; but black is now commoner. All colors fade more or less on continual exposure to light.

PAPER.—The usual size of the page carried by the type-writer is one of 8½ inches, in half sheets. Ruled paper is unnecessary, as the machine makes its own lines. Paper of almost any texture can be used with good effect.

DUPLICATING OR MANIFOLDING.—Several copies can be made at once by the use of carbon-paper, or in some cases by the use of thin oiled paper, with double carbon-paper. Care is necessary in adjusting the sheets. By the use of the oiled paper, as many as twenty or more copies have been made at once. In this process, the ribbon is removed to prevent it from interfering.

The appearance of the T.W. as a time and labor-saving invention, especially since about 1882, when its larger usefulness became disclosed, has been an event of the greatest magnitude. It has created a revolution. It has facilitated business in all the old-line industries, and created many new ones for itself. T.W. schools abound in all our cities and large towns, and avenues for high grade employment at remunerative wages have been opened to a countless number of young men and women. Type-writing, aided by its yoke-fellow, stenography, has in a decade changed the whole face of affairs. In short, so important is the place which the little T. W. has made for itself in an almost incredibly short time, it would be equivalent to a revolution backward to now dispense with its use. Many persons suffering from *chorea scriptorum* (see SCRIVENER'S PALSY) have been enabled to dispense with the services of an amanuensis and still to retain their independence in writing by the use of these machines; and the gain in clearness of "copy" is very great, obviating many typographical errors unavoidable when compositors were obliged to set their type directly from the author's manuscript. Naturally, great diversity of opinion exists as to what constitutes a "perfect" machine, some considering speed the first requisite, others handsome print, and others still portability, or great manifolding capacity.

TYPH-FEVER is a term which has sometimes been used to designate continued low fever. The best-marked varieties of this affection are known as typhus and typhoid fevers, which in typical cases are easily distinguished from one another, but not unfrequently so merge into one another that it is difficult to decide whether the disease should be classed as typhus or typhoid fever; and hence the general term typh-fever is a very convenient one in doubtful cases. All the typh-fevers belong nosologically to the miasmatic order of zymotic diseases.

TYPHA, a genus of plants, belonging to the natural order *typhaceæ* of some botanists, which, according to others, is a sub-order of *araceæ*. The *typhaceæ* all inhabit marshes or ditches. They have nodeless stems, unisexual flowers arranged on a spadix without a spathe, the spadix of the male flowers being situated at the summit of the stem, above that of the female flowers, the perianth consisting of scales or lax hairs, the anthers on long filaments, the fruit dry, consisting of the seed with adherent pericarp. They are found in very different climates, and scattered over the world. Two species of typha are found in America, *T. latifolia* and *T. angustifolia*, and are popularly known as CAT'S-TAIL or REED-MACE. *T. latifolia* is the most common. It is sometimes called bulrush. It grows to the height of five or six feet. The root-stocks are astringent and diuretic, and abound in starch. The young shoots both of this and *T. angustifolia*, a smaller plant, are much eaten by the Cossacks of the Don; and are sometimes used in England under the name of *Cossack asparagus*. The pollen of typha is inflammable, like that of *lycopodium*, and is used as a substitute for it. *T. angustifolia* and *T. elephantina* are employed in India for making mats and baskets.

TYPHON, in Egyptian mythology, was the Greek name of a son of Seb (Kronos) and Nut (Rhea). The latter gave birth to five children on the last five days of the year; first, Osiris and Haroeris, then Typhon, and lastly Isis and Nephthys. The Egyptian name of Typhon was Set, also Suti and Sutech, and in the earliest times he was a highly venerated god. He often appears on the monuments in the form of a beast, the cunning crocodile, the dreaded hippopotamus, or the obstinate ass, and with yellow hair and long blunted ears. From him the kings of the 19th dynasty, Seti (Sethos, Sethosis, changed by Herodotus into Sesostriis), derive their name. The city of Ombos was a special seat of his worship. In later times, however, either about the close of the 21st dynasty or afterward, his worship was abandoned, and his figure and name were obliterated from many of the monuments. The cause of this curious religious revolution is unknown, but at any rate, Typhon came to be regarded as a god hostile to the Egyptians, and was gradually developed into a personification of the principle of evil—in short, the Egyptian devil, the opponent of holy doctrine, and adversary of Osiris—the god of the waste howling wilderness, of the salt lakes, of drought, and of scorching heat.

The connection between the Egyptian Set and the Greek Typhon is not very easy to trace, but it undoubtedly existed. According to Homer Typhon (called also Typhāon) was a huge giant, chained under the earth in the country of the Arimoi, and lashed by the lightnings of Zeus. Hesiod makes him a son of Typhōeus and a hurricane, and, by the snake-goddess, Echidna, the father of the Chimæra, the many-headed dog Orthus, the hundred-headed dragon that guarded the apples of the Hesperides, the Colchian dragon, the Sphinx, Cerberus, Scylla, Gorgon, the Lernaean Hydra, the eagle that consumed the liver of Prometheus, and the Nemean lion. Typhōeus, again, was the youngest son of Tartarus (hell) and Gæa (earth), or, as others say, of Hera (Juno) alone. At a later period the father and son coalesced into one person. Pindar describes Typhon as a monster with a hundred dragon-heads, fiery eyes, a black tongue, and a terrible voice. He sought to wrest the sovereignty of the world from Zeus, but after a fearful struggle, he was subdued by a thunderbolt from Olympus, and hurled into Tartarus, or buried under Ætna. The later poets modify the older myth with fabulous additions of their own. They connect Typhon with Egypt—a proof, perhaps, that he had come to be identified with the Egyptian Set. According to Ovid and others, all the gods fled before him into Egypt, and through fear, changed themselves into animals, excepting Zeus and Athene. After an appalling struggle, in the course of which Zeus was once hamstrung, and carried off by the daring monster, Typhon was vanquished, but not before he had hurled all mount Hæmus against his adversary, in a paroxysm of supernatural rage. It is very possible that the fierce physical opposition of Typhon (especially when the monster came to be identified with Set, the Egyptian devil) may have had (along with other causes) a material influence in determining that popular conception of "satan" which reigned both in patristic and mediæval times, and of which Milton has so largely availed himself in his *Paradise Lost*.

TYPHOONS' (Chinese *tei-fun*, i.e. "hot wind;" the word, it need scarcely be said, has no connection with the Typhon of mythology) are violent storms which blow on the coast of Tonquin and China as far n. as Ningpo and the s.e. coasts of Japan. Varenus, in his *Geographia Naturalis*, describes them as "storms which rage with such intensity and fury that those who have never seen them can form no conception of them; you would say that heaven and earth wished to return to their original chaos." They occur from May to November; but it is during the months of July, August and September,

that they are most frequent. They resemble the storms of western Europe (see STORMS) in their general characteristics, with this difference, that the main features are more strongly marked. There is a depression of the barometer, over a space more or less circular in form, accompanying the typhoon, but it is generally more contracted in area, and deeper and more abrupt than in European storms. It is not uncommon for the barometer, at the center of the depression, to read 28.3 in., and on rarer occasions to fall even as low as 27 in.; and the changes of pressure are very rapid, frequently .2 or .3 in. in an hour. It is this enormous difference of atmospheric pressure between neighboring places, and the consequent rapidity of the fluctuation, which give to these storms their terribly destructive energy—the law regulating the strength of the wind being, that it is proportioned to the difference of pressure between the place from which it comes and the place toward which it blows. The low pressure in the center is confined to a very limited space, and since all around this space the pressure is greater, it follows that the level of the sea there will be higher. Hence, a high wave is frequently found to accompany these storms, advancing inland, carrying with it ruin and dismay, and not unfrequently bearing ships far over the level fields, where they are left stranded a considerable distance from the sea.

Typhoons have their origin in the ocean to the east of China, especially about Formosa, Luzon, and the islands immediately to the south. They thence proceed, in four cases out of five, from e.n.e. toward w.s.w., more rarely from e.s.e. to w.n.w., and scarcely ever from n. to s. or from s. to n.; in other words, their course is generally along the coast of China. The body of the storm advances at the rate of 12 m. an hour and upward, within which the winds blow often from 80 to 100 m. an hour, whirling round the center of atmospheric depression in a direction contrary to the motion of the hands of a watch, as all storms in the northern hemisphere do. They thus rotate in the direction s., e., n., w.; and travel along the coast, so that the coast feels the northern side of the storm, while at a distance from the coast the southern side is alone experienced. The s.w. monsoons (q.v.) prevail in summer over southern Asia, to the eastward of which are the n.e. trade-winds. See WIND. Here, then, are two great aerial currents flowing contiguously, *but in opposite directions*, each highly charged with moisture, especially the s.w. current, which they have taken up from the oceans they have traversed. It is highly probable that the typhoons take their origin from these opposing currents, as whirlpools do at the meeting of two sea-currents; and their intensity is aggravated by the large quantity of heat disengaged in the condensation of the vapor of the atmosphere into the deluges of rain which fall during the storm—10 and 12 inches of rain frequently falling in one day. Much yet remains to be done toward the examination and explanation of this remarkable class of storms, the first and essential step being the establishing of meteorological stations on the Chinese coast, in Japan, in Formosa, and in Luzon.

TYPHUS AND TYPHOID FEVERS. I. TYPHOID FEVER.—An infectious, parasitic, febrile disease, classed among the continued and not eruptive, or exanthematous fevers, and characterized by an invasion of bacilli, and consequent pathological changes in several internal organs of the human body. Formerly typhoid was more or less confounded with typhus fever, but since 1850 certain facts have been recognized in all civilized countries in regard to the mode of communication and development of the contagious element, and exact knowledge has increased from that time to the present. It has only been by the power of the microscope, comparatively recently perfected to a wonderful degree, that science has been able to detect the lurking foe and avoid its attacks.

The direct cause of the affection is the entrance into the system of numbers of microscopic organisms (see GERM THEORY OF DISEASE), first discovered and described by Eberth in 1880, and by Klebs, and after them by Koch and many others. The microbe is a small bacillus of one third the diameter of a red blood globule in length, and one third the diameter of its length. Each end is rounded and contains a shining, round body, which may perhaps be a spore, from which other bacilli become developed. The *bacilli typhoides* of Eberth will produce free cultures (see BACTERIUM) on potato, gelatine, blood serum, bouillon, etc. They also rapidly multiply in sterilized milk, and may live in it for thirty-five days, and in butter twenty-one days. Many articles of diet are good culture media for bacilli, but only a few of the cultures are characteristic, that on the potato being the most so.

It has been claimed that typhoid fever was known to Hippocrates, but nothing definite is heard of it before the seventeenth century, when Spigelius observed in some post-mortem examinations lesions especially characteristic. Bartholin, Willis, Sydenham and others observed the same special features and discovered more. In the next century Huxham, Lancisi, Morgagni and others described either the symptoms or lesions of typhoid fever; but it was not known to be a distinct entity or as other than a variety of continued fever. In Germany, Von Hildenbrand, in 1810, is said to be the first to clearly distinguish between typhoid and typhus fevers. Some years later Louis added further knowledge, but no one had as yet demonstrated the separate existence of typhoid fever. This is claimed to have been done by Gerhard and Pennock of Philadelphia, in 1837, and that as a result its individuality was recognized in America sooner

than in France or England. It was not until 1849 and 1853 that Sir William Jenner, in a series of able papers, published during that period called the attention of the medical world to the fact that typhus and the so-called typhoid fever were as distinct as any two of the exanthemata. His writings did much to set the vexed question at rest, although many years elapsed before the specific distinctness of the two fevers was finally and universally recognized.

From the time of the labors of Jenner and others, more than a quarter of a century was passed in laborious researches with microscopes and methods of preparation of objects—improving in instruments and methods, getting nearer and nearer from year to year—before the “eureka” of triumph could be announced. Before the actual discovery, however, of the *bacillus typhoides* the germ theory of disease had been placed upon a pretty firm foundation, many poison-producing microbes having been discovered. The microbe of typhoid fever, though only one ninth of the sectional area of a blood globule, had to strike its colors at last to the enormous power of the microscope.

Typhoid fever is more or less prevalent all over the world. Until recently the tropics were thought to enjoy an immunity, and it is more rare there than in northern latitudes. It is met with in India, and Hirsch thinks that climate does not exert a determining influence, but it certainly does exert a powerfully controlling influence, or the tropics would never have been supposed to be exempt. In fact, the germ is just as hardy and vital as its environments allow. It flourishes in cool, moist climates like that of the British Isles, where it is endemic. It is most common in England, but more in Ireland than in Scotland, and in all, more prevalent on the west than on the east side (Murchison). In Iceland, where it is known by the name of *landfarsot*, or “sickness of the country,” it is met with every year, often as a malignant epidemic. It prevailed extensively among the British troops in the Zulu, Egyptian and Soudan campaigns, and among the French soldiers in Tunis. In North America it is endemic from Greenland to Mexico, and it has been observed throughout South America and most parts of Australasia.

It is stated on high authority that typhoid fever sometimes arises apparently independent of a previous case, in the presence of fermenting fecal and other forms of fermenting matter, in which presumably the “resting spores” have lurked. It may be communicated by persons in health by being carried, but even then the poison is not like that of smallpox or scarlet fever, or typhus, given off from the body in a virulent form, but is developed from the decomposition of the excreta discharged by a patient.

In regard to the access, or paths of infection, it may be transmitted by currents of air, where the wind can take up from the surface where they may exist, microbes or germs ready to be propagated if they happen to be conveyed to any part of a person's body or clothing from whence they might reach the alimentary canal or mouth of such person, or by his handling clothing or articles upon which the bacilli of the disease had become active, or had preserved their vitality. Drinking water is the most common medium for the dissemination of typhoid fever; not that from which bacilli have been excluded, but that which comes from rivers and ponds and wells which are located near privies and cess-pools, where the stools of typhoid-fever patients are thrown. This, and the carelessness associated with it, is the principal cause of the spread of the disease, and it is proper here to remark that great care should always be taken in the disposition of the excreta. It should be thoroughly disinfected by turning it in some vessel and covering it with a strong solution of chloride of lime, and in the absence of this, some other efficient disinfectant (consult the art. HYGIENE).

The season of the year has much to do with the frequency of the attacks. It occurs most frequently in the autumn, but prevails to a greater or less extent at all seasons. According to Murchison, out of 5988 cases seen in the London fever hospital during twenty-three years, 2461 occurred in the autumn, 1490 in summer, 1278 in winter, and 759 in spring. According to Bartlett, of the 645 cases of typhoid fever admitted to the Lowell hospital during a period of eight years, 250 occurred in the autumn, 163 in the summer, 130 in the winter, and 102 in the spring. It has generally been remarked that typhoid fever is apt to prevail most after hot and dry summers. Pettenkofer and Buhl showed that it was more common on the ground level of the water—that is, when the water was low—which then was thought to allow the germs to develop rapidly in the soil and filter through the surface into the wells. The operation of these causes will depend much upon the character of the soil and subsoil and other geological, as well as surface conditions. Baumgarten suggests that the dust of dry seasons may disseminate the germs, and it is thought by some that the suggestion adds to the probability that in some cases the bacilli may enter with the inspired air; but this latter supposition is not as probable as that the dust may enter the mouth and pass to the stomach by swallowing.

There is no reason to believe that sex exerts any influence, except so far as it may determine the occupation, and therefore the place of residence, or the locality where most of the time is passed. Young men are more apt to congregate in cities, where the causes of typhoid fever are generally most active, and are therefore more liable to become subjects of the disease than the females who have remained in the country. It occurs at all periods of life, but more often between the ages of 15 and 25 years, becoming less after 35, and becoming more and more seldom till after 50 and 60; but is occasionally met with up to extreme old age. It is more general in very early life than is usually supposed. Murchison reports its occurrence in an infant six months old, and Charcclay has reported two cases in infants but a few days old, while several observers

have discovered evidences of the disease in the fœtus. Dr. Pepper has observed several cases during the first year of life, and has seen patients recover from well-marked attacks after seventy-five years of age, and Hamernyk has recorded a case of recovery in a patient over ninety years old.

The typhoid bacilli possess great vitality; they have been known to remain active in parts of the body fifteen months after convalescence, and outside of the body may retain their vitality in water for weeks, and in badly drained soil are said to be capable of multiplication, and may continue to live for an indefinite time. They are killed by exposure to moist heat, but not by heavy frost. According to Prudden they may live in ice for months, and Seitz has shown that they will multiply at a temperature of 37.4° F. They will develop in milk without changing its appearance, and will continue to live in fœces for long periods. Sunlight is destructive to them. Janowsky found that cultures ceased to develop after four to eight hours' exposure to sunlight. How do they enter the system? Certainly by way of the mucous membrane, but it has not been proved that they enter by way of the respiratory tract. It is quite certainly by way of the mucous membrane of the intestinal canal. That they may be transmitted through the mother to the fœtus has already been stated. As to their exact mode of action after entering the intestine, our knowledge is as yet insufficient. They may, perhaps, multiply in the intestinal contents, or at least acquire further development before penetrating the mucous membrane. At any rate, they soon find lodgment in the lymph glands of the bowel; also in the mesenteric and other lymphatic glands, and in the spleen and liver. Their development yields certain toxic agents. Brigger, Fraenkel, and Vaughn have described ptomaines which are capable of producing poisonous symptoms when administered to the lower animals, and it is probable that the constitutional symptoms of the disease are due to the action of these toxic products. Typhoid fever is not contagious in the same way that typhus is—that is to say, there are no exhalations from the skin of contagious matter, which shows that the *contagium* is of much finer organization in the latter disease and more volatile. The infectious material of typhoid fever is contained in discharges from the bowels, and in vomited, and perhaps expectorated matter. The alvine discharges, by drying and becoming diffused in the air, as in sweepings from hallways and sidewalks, may enter the mouth of unsuspecting passers by and be swallowed. The tenacity of the life of the typhoid-fever bacillus, therefore, allows of extensive dissemination. One of the most remarkable epidemics which ever occurred was at Plymouth, Pa., in 1885, and was studied by Dr. L. H. Taylor, of Wilkesbarre. A mountain stream supplied the germs from a single patient along its bank many miles away from the town. More than 1000 cases developed at the rate of 50 to 100 a day, and nearly 100 persons died.

As might be supposed from what has already been said, the anatomical characters of typhoid or enteric fever are inflammatory tumefaction, ulceration, and sloughing of the glands of the small intestines, and less frequently those of the large intestine also. The solitary and agminated glands of Peyer (see PEYER'S GLANDS) of the ileum are especially affected, and there is tumefaction of the mesenteric glands and spleen. The alterations taking place in the solitary and agminated glands of Peyer are usually divided into four stages, viz.: (1) the stage of infiltration and engorgement, in which the follicles project above the surface of the mucous membrane, their capillaries becoming filled with blood. This first stage begins early, Murchison detecting it in two cases dying at the close of the first day. It reaches its height about the middle of the second week. In a large number of glands, resolution now takes place, accompanied by decrease of tumefaction. (2) The second stage, or that of necrosis or death of the gland, rarely begins before the middle of the second week, and reaches its height toward the end of the same week. The follicles die and form sloughs, and the process may occur in all or only some of the follicles of the patches of Peyer, and may be superficial, or extend to the serous coat of the intestine, perhaps producing perforation of the bowel into the cavity of the peritoneum. The stage is most marked at the lower portion of the ileum, which may to a great extent have a sloughing condition. (3) Following the death of the gland is the stage of ulceration. The sloughs loosen, and at about the end of the third week are detached, leaving ulcers. Sometimes a whole Peyer's plaque is involved, leaving an oval ulcer. The solitary glands also undergo ulceration. (4) The stage of cicatrization begins about the commencement of the fourth week of the disease, and continues for two or more weeks. Delicate gray granulations cover the floors of the ulcers, and sometimes secrete pus, at last being replaced by connective tissue, the cicatrices appearing as smooth thin spots remaining for years. It must be remarked that these stages are not necessarily simultaneous. The same Peyer's patch may show cicatrization in one part and sloughing in another. There may be, therefore, perforation after convalescence has apparently commenced. At the same time with the earlier changes in the above-named glands there are pathological changes going on in the mesenteric glands and spleen. The latter organ nearly always becomes enlarged. The enlargement, generally greater in the severer cases, begins with hyperæmia, the capillaries and veins being enlarged and the sinuses filled with red and white blood cells. Rupture has been known to occur. The liver may become the subject of degeneration. It early becomes hyperæmic; it is softer than normal, and the outlines of the lobules are not well marked. The gall bladder is sometimes affected with catarrhal inflammation and ulceration. The kidneys and other organs are more or less pathologically affected, but space does not permit their consideration.

The temperature is one of the most important symptoms in typhoid fever, and the most comprehensive account of its behavior is given by Wunderlich. He maintains that the presence of the disease can certainly be decided when both morning and evening temperatures have been taken for a short space of time. In the beginning of the fever about three days' observation only are required for diagnosis, but in the height, and in the convalescence, from four to six days are necessary as a rule; but there are occasionally rare cases in which it never rises above the normal point, and a subnormal temperature has been observed in severe cases with well-marked intestinal lesions. The period of invasion may vary considerably. Where the poison is very virulent it may not exceed four or five days, and Griesenger mentions a case in which it was accomplished in one day. On the other hand it is claimed that it may extend to three or even four weeks, but such cases are difficult to determine, and about a week may be stated as the average. The fever increases from day to day, with a morning and evening exacerbation, and a remission in the early morning. By the end of the first week the temperature, taken under the tongue, reaches 103° or 104° F., as a rule. During this time the patient is dull and apathetic. There is often severe headache, and the hearing is indistinct. The pulse increases in frequency, but not in proportion to the increase of temperature, and is full, and rather soft. The temperature is likely to rise until the fourteenth day with some variation, and exacerbations and remissions, and sometimes higher; but this will depend much upon the treatment, and the constitution of the patient, as will presently be noticed. After the fourteenth day the exacerbations and remissions generally become more irregular, and by the twenty-first day the temperature begins to decline rapidly. The range of temperature in typhoid fever differs much from that in typhus, being much shorter in the latter disease, lasting as a rule only about fourteen days; but the range of typhoid is often less than that named above, under the most favorable circumstances. Pressure in the right iliac region reveals gurgling sounds and tenderness, and there will be more or less rumbling in other parts of the bowels. The ascending, transverse and descending colon will be found more or less distended with gas, giving a sort of tub-shape to the rather prominent abdomen, as was remarked by Sir William Jenner. The pain in the right iliac region is, of course, the consequence of the Peyer's glands and follicles in the lower end of the ileum becoming ulcerated. Constipation is generally present at the commencement, but diarrhoea may set in immediately with dull yellowish stools. At about the end of the first week, or two or three days later, a distinctly characteristic eruption of rose-colored spots, diagnostic in their number, aspect, time of appearance and duration, make their appearance upon the upper part of the abdomen and lower part of the chest. They vary in number from one, two or three, to twenty or more, but they are the rose-colored spots of typhoid fever, and that alone. They appear in succession, perhaps until the end of the third week. In rare cases they spread over the whole surface of the body. These spots are slightly elevated, and from 1 to 3 lines in diameter, easily disappearing on pressure, returning as soon as the pressure is removed. Each spot lasts two or three days and then gradually fades, sometimes leaving a slight stain. Fresh crops appear at intervals of three to five days, but there is no regularity of sequence. Murchison has counted as many as 400, but there may be but few, two or three in the course of the disease; and in children, more often than in adults, there may be no eruption at all.

Treatment.—This need occupy but a little space, for the reason that the practitioner must be entirely relied upon to manage the case. It will, however, be proper to state briefly the general rules of treatment. The patient should be kept cool, and bathed frequently, and occupy a large, well-ventilated room. In regard to alcoholic stimulants, they are generally recommended, but the reason for their use does not seem to be sufficiently explained. They are generally given to support the strength, but that really involves the question as to how much alcoholic stimulants support the strength. This is denied by many, but no one disputes their power to destroy, or to combat the effects, upon the system, of organic poisons. In typhoid fever the bacilli furnish, during their development, toxic principles to which the disease owes its virulence, and to these principles much of the power of the alcoholic stimulants is addressed, acting probably very much in the manner in which they combat the effects of the bites of poisonous reptiles. The amount of stimulant should be proportioned to the effect it produces; not the immediate effect, but that which is seen a few hours after the administration, which, therefore, requires considerable judgment, and must be left to the medical attendant. It is good practice to give cooling drinks freely. The diet ought not to be stimulating or abundant, but sufficient and nourishing enough to allow the system to keep up the process of assimilation and nutrition with as little loss of tissue as possible. The alkaline ingredients of the blood are apt to pass away rapidly in this disease, and therefore it will be found beneficial to administer two or three times a day or oftener moderate doses of bicarbonate of soda, and occasionally smaller doses of the corresponding potassa salt, in the proportion of about one or one and a half drachms of the former and one half a drachm of the latter, daily. Quinine forms an important part of the medicine, and may be given in doses of one or two grains three, four or five times a day, for a short period, or longer, depending so much upon the symptoms that no directions can here be given, or even suggested. As to other remedies the same may also be said. Wakefulness is sometimes one of the distressing elements in a case of typhoid fever, and will often tax the ingenuity of the medical, as well as all the other attendants; but here it must be remarked that quiet, and therefore, very few attendants or nurses, is an important mat-

ter. It will also be found that experience confirms the remark that when a patient suffering under typhoid fever gets enough nourishment, but not too much, and has the toxic elements which are furnished by the development of the microbes, contended against, and the surface of the body is kept as cool as is consistent with the necessary progress toward convalescence he need not pass so very uncomfortable a period as has been, until within quite recent times, regarded as unavoidable. Great progress has been made in the management of typhoid and typhus fevers. In the discriminating use of refrigerants, much is to be looked for. There is a disposition to carry the use of cold baths too far, and the administration of antipyretics, especially the coal-tar derivatives, ought to be discouraged, as it is admitted, even by those who employ them, that they weaken, and sometimes destroy the heart's action. It is believed that the parting words of Sir William Jenner on the treatment of typhoid fever will be of advantageous insertion here. He says: "While admitting without reserve that heroic measures, fearlessly, but judiciously employed, will save life when less potent means are useless, the physician whose experience reaches over many years, will, on looking back, discover that year by year he has seen fewer cases requiring heroic measures, and more and more cases in which the unaided powers of nature alone suffice for effecting a cure; that year by year he has learned to regard with greater diffidence his own powers, and to trust with greater confidence in those of nature."

Typho-malarial fever.—This name has, by common consent, been given to the simultaneous existence of typhoid fever, and the fever produced by swamp miasm, or malaria. All the abdominal changes take place as in a case of pure typhoid, and the microbic development is, therefore, not absent. The malarial element sometimes adds grave complications, and seems often to intensify the poison, the temperature often attaining a greater height. Where the malarial element enters largely into the disease it need scarcely be said that, as a rule, quinine should be relied on to a considerable extent, as it is, *par excellence*, the destroyer or opposer of malaria. In regard to the use of calomel, it may be said here with propriety that small doses, often not more than one tenth of a grain (and pellets of that amount are now found at most druggists), given several times a day are now generally admitted to have the power of restoring the action of the cellular elements, and other glands, including the intestinal. This remedy therefore places a considerable controlling power in the hands of the physician, and this remark applies as well to cases of pure typhoid or typhus fever as to those mixed with malarial elements. As to the bibliography of typhoid fever, an enumeration of the many authors who have written well upon the subject would be altogether too extended and unnecessary here, and a shorter list would perhaps seem partial. A consultation of any extensive medical treatise on the subject will satisfy any curious reader. The above brief sketch of typho-malarial fever is deemed called for, because of the independent place given to it in works of repute on fevers.

II.—**TYPHUS FEVER.**—An acute, specific and highly contagious fever, endemic, and also prevailing in epidemics, especially in times of destitution and in the presence of overcrowding and bad ventilation, presumably due to a micro-organism, as yet undiscovered, and attended with no characteristic lesion of the tissues, as in the case of typhoid fever, but with serious alteration of the blood. It is ushered in by an abrupt onset, with marked nervous symptoms, rheumatic pains, rigors and headache. A maculated eruption appears, most commonly on the fifth day of the disease, of slightly elevated spots, deble on pressure at first, afterwards persistent and darker, and there is early prostration of the nervous and muscular systems. Delirium usually comes on during the second week, sometimes of an acute and noisy character, but oftener of a low, wandering kind, with a tendency to stupor. The fever terminates by a crisis, which generally occurs on or about the fourteenth day.

Among authors who have written upon the subject Sir John Pringle occupies a foremost place, and gave an excellent description of the epidemics occurring in the British army in 1742 and 1745. Its literature is much older than that of typhoid fever, because the latter disease was, until within the last fifty years, supposed to be only a variety of the former. Murchison gives ninety-eight names by which it has at various times been called. Previous the time of de Suavages it was called "pestilential," "camp," "jail," "hospital," "ship fever," and other similar names. From its contagious nature it was called "parish infection" in the English bills of mortality of 1600-1700, and it has borne the names of "morbus pulicans" and "spotted fever." Hirsch says that Fracastori, who lived in Verona in 1483-1553, mentions it under the name "lenticulæ." On account of the cerebral symptoms, it was called "typhus comatosa" by de Suavages in 1760, and "brain fever" by various authors. "The history of typhus," writes Hirsch, "is written in the dark pages of the world's story which tell of the grievous visitations of mankind by war, famine and misery of every kind." It has from time to time prevailed in all parts of Europe, but to a greater degree in Great Britain, Ireland and Russia. Ireland has been more afflicted than any other country. In the United States and Canada it has at various times appeared as an epidemic. It is said to be scarcely known in Australia, New Zealand, India, Africa, or the tropical parts of America. It is a disease of the temperate and cold zones, and this fact is regarded as caused to a considerable extent by the mode of life adopted by a great majority of the peoples of cold countries congregating, as multitudes of them do, in badly ventilated habitations. Hirsch remarks "The idea that overcrowding in filthy and unventilated rooms affords the essential conditions for the development of typhus foci, and for the spread of the disease, has been

completely borne out by the experience of all times." But epidemics of typhus fever are becoming rarer year by year.

In all cases typhus arises from the reception into the system of a specific virus, of the intimate nature of which we as yet positively know nothing, although observers with the microscope have at times been encouraged to believe that they have made valuable discoveries. Dr. Cayley, the editor of the third edition of Murchison's *Treatise on the Continued Fevers of Great Britain*, says that "it seems probable that typhus is due to a specific *microbe* which requires conditions of overcrowding and imperfect ventilation to develop its virulent and contagious properties." In 1868 Hallier announced the discovery of a *typhus fungus*, but the discovery has not been confirmed. In 1873 Zuelzer claimed to have obtained "positive results" from infection experiments in animals, but there is no evidence that the disease produced in the animals experimented upon was typhus fever. In 1883 Mott (*British Med. Jour.*) described active dumb-bell cocci in the blood and plugs of cocci in the lymphatics of the heart in cases of typhus fever, and other researches have been made, but without definite results. There are, however, certain interesting facts which are known respecting the typhoid-fever poison. Actual contact is not necessary for its communication. The contagious principle is cast off by exhalations from the lungs and skin, and most probably from the alvine evacuations. The "striking distance" of typhus is not great, if a limited fresh air space separates the patient from the healthy person; as if the poison became disorganized by contact with fresh air, oxidation being a suggested cause. It is readily absorbed by clothing, bedding, furniture, wooden beams, etc. The experiments of Dr. O. Motschutkovsky show that neither typhus nor enteric fever can be communicated to man by inoculating the blood. One attack generally confers immunity from a second, but there are exceptions. Murchison himself suffered from several attacks, each attended by the characteristic eruption. Observation and experiment show that the *contagium* of typhus fever is lighter than atmospheric air. It is found that it will spread to the upper stories of a hospital when it is treated on the ground floor; but patients in the lower stories enjoy immunity when the typhus patients are treated on the upper floors. "This was so well known," says Dr. Moore, the author of a classical work on fevers, "at the Meath hospital when I was a student there a quarter of a century ago, that the typhus cases were treated in wards at the top of the General hospital. This plan has been long since abandoned for that of isolated epidemic wards."

Among other characteristics of typhus fever which differ from those of typhoid are the absence of the peculiar affection of the agminated and solitary glands of Peyer in lower portion of the ileum, and the consequent pain in the right iliac region. The mesenteric glands do not contain anything resembling the typhoid material, there being no bacilli to be found; and it can hardly be supposed that there is any similar poisonous organism there, or it would produce its effects.

The spleen is frequently enlarged and softened and the heart is often flabby. It may be that some organism will be found in them, but if so it will be so minute as to challenge the powers of the microscope. The blood in the heart and large vessels is unnaturally dark and fluid. Congestion of the lungs and pulmonary oedema are more frequent than in typhoid fever. Cerebral congestion and effusion of serum into the ventricles of the brain and the arachnoid cavity are not uncommon. The kidneys are apt to be congested, enlarged, and the convoluted tubes filled with desquated epithelium. There is more congestion of the capillaries of the face and general surface than in typhoid fever, which gives the face especially a dusky hue, compared with its appearance in typhoid, so that the nurses in hospitals learn to discriminate between them by the physiognomy. An expressionless countenance is the usual characteristic which corresponds to the general dullness and nervous apathy of the disease. Delirium is more frequent than in typhoid, and is sometimes accompanied by contraction of the pupil, and may be so marked that it has been called by Graves *pin-hole pupil*. The tongue, oftener than in typhoid fever, becomes covered with a thick brown or black coating. Sometimes it is reddened, glazed and fissured. Diarrhoea is often absent in typhus, and when present is generally slight, and the same may be said of tympanitis (drum-like sound on percussing the abdomen, caused by collections of gas). Perforations of the intestine do not occur, as ulceration of the bowels is absent, and hemorrhage from the bowels is a rare occurrence. The copiousness of the eruption generally corresponds to the gravity of the disease, which statement does not hold good with typhoid fever, but it is stated by Flint that among the characteristic maculae there are occasionally mingled a few rose-colored papulae of typhoid. Although diarrhoea is a rare occurrence in typhus, dysentery is not very infrequently present, and, as has been mentioned in the article on Typhoid Fever, the two are sometimes thought to exist together.

Treatment.—As in the case of typhoid fever, little can be said here of advantage and interest, except to allude to general principles. Frequent ablutions are to be recommended, both on account of cleanliness and refrigerating effects. In regard to baths the same remarks which were offered in the treatment of typhoid are applicable here. The administration of drugs should not be looked upon as having much curative effect, and the employment of antipyretics should be regarded with reluctance, as they always have a depressing effect upon the heart's action. The best antipyretics are the natural refrigerants and their innocuous salts, as bicarbonate of soda conjoined with small doses of calomel, which increase the tendency to general glandular action. The immense surface covered by the sudoriferous glands of the skin is not to be disregarded. When

the general glandular system is acting, as it is powerfully assisted in doing by the effects of these simple medicines—for the soda is really a supply of nourishment to replace the waste of this element by fever—and when this is assisted by proper quantities of alcoholic stimulants, given with discrimination, with the requisite amount of nourishment in the form of milk, soft-boiled eggs and beef tea, chicken or mutton broth, much reliance can be placed upon the powers of nature, and the quotation from Sir William Jenner at the close of the article on TYPHOID FEVER may be read with advantage. Of course quinine, the different ingredients of opium, and other medicines have their use and are not to be disregarded by the intelligent physician, but it is unnecessary to speak of them in an article intended not for his instruction, but as affording an intelligible guide to the general reader, and affording him a reasonable amount of information.

TYR is the old Norse name of a god, who, however, did not belong exclusively to the northern mythology, but was common also to the German, being called in old High-German *Ziu* or *Zio*, and in Ang.-Sax. *Tiw*. He was the son of Odin, and was the god of war and of fame, which idea is expressed in old Norse by the word *tyr*; and when the Romans and Greeks speak of a Mars or an Ares among the Germans, it is Tyr that is meant. According to the Edda, he was single-handed. When the Asa-gods persuaded the wolf Fenrir to allow himself to be bound with the bandage Gleipnir, Tyr put his right hand in the wolf's mouth, as a pledge that he would be loosened; and when the gods refused to release him, the wolf bit off Tyr's hand to the wrist, which was called, in consequence, *ulflithr*, or the wolf's joint. In the twilight-battle of the gods, he meets his death at the same time with his enemy, the monster dog, Garmr. The old Norse Runic character ᚢ bore the name of the god. The third day of the week, too, the *Dies Martis* of the Romans, is called after him, in old Norse, *Tyrsdagr*; Ang.-Sax., *Tuesday* (from which our English *Tuesday*); old Friesic, *Tysdei*; old High-German, *Ziruestac*; in the n. of Germany, *Tiestac* or *Diestac*, from which the German of the present time, *Dienstag*. Places, and in particular hills and plants, were named after him. The word Tyr appears in epithets of Odin, signifying god in a general sense; as, for example, *Sigtyn*, that is to say, the god of victory; also in epithets of Thor, as *Reidhartyr*, the god of the chariot or of thunder.

TYRANT (Gr. *tyrannos*, Doric for *koiranos*, from *kuros* or *kurios*, a lord or master), a name given in modern times to an arbitrary and oppressive ruler, but originally applied, not necessarily to one that exercised power badly, but merely to one that had obtained it illegally, and therefore equivalent to our word *usurper*. The ancient Greek "republics," it must be remembered, were generally aristocratic and even oligarchic in their constitution. When the "governing families" among the Athenian or Syracusan nobles, for example, quarreled with each other, it was natural, if they could not otherwise agree, that the boldest and most reckless of the set should seek for success by allying himself with the masses of the people, should figure as their champion, promise to redress their wrongs or increase their comforts, and when a fitting occasion presented itself, should, by a clever if somewhat violent stratagem—*coup d'état*, it is now called—deliver them from the domination of his order by himself grasping possession of absolute power, and ruling without any other restraint than the necessity of retaining his popularity imposed—even this limitation being frequently absent when a body-guard of foreign mercenaries rendered it superfluous. If the political adventurer who thus rose on the ruins of the constitution happened to be a man of sense, and wisdom, and generosity, his "tyranny" might prove a blessing to a state torn by the animosities of selfish oligarchs, and be the theme of praise in after-ages, as was the case with the "tyrannies" of Peisistratos (q.v.), Gelon (q.v.), Hiero II. (q.v.), and many others; but if he was insolent, rapacious, and cruel, then he sought to reduce the citizens to a worse than Egyptian bondage, and his name became infamous to all time. Such has been the fate of most of the "thirty tyrants of Athens" (q.v.), more particularly of the blood-thirsty Critias, of Alexander of Phæræ, of Dionysius the younger, etc. It was the method of exercising authority pursued by these and similar usurpers that latterly, even in ancient times, gave the word tyrant that evil significance it has ever since uninterruptedly retained.—See Plasz, *Die Tyrannis bei den Griechen* (Bremen, 1852); Wachsmuth, *Hellen. Alt.*, vol. i. pp. 279-88; and the histories of Thirlwall and Grote.

TYRANT SHRIKE, the popular name of a section of the shrike family (*laniadæ*), connecting that family with the fly-catchers (*musciicapidæ*), and entirely American. In the genus *tyrannus*, the bill is straight, rather long, strong, the upper mandible rounded above, the point suddenly hooked. The birds of this genus are remarkable for their fierce and bold disposition. They are always ready for battle, and often engaged in it. In defense of their young, they rush against any aggressor. The tyrant shrike, TYRANT FLY-CATCHER, or KING-BIRD (*T. intrepidus*) of North America, has no hesitation in attacking an eagle, rising above him and pouncing down upon him. This species migrates northward in summer as far as lat. 57°. It feeds much on the larvæ of insects, but has an unfortunate fondness for bees, and will take its post on a fence or bush near a hive, to dart upon them as they depart or return; on which account it is disliked by American farmers. The true tyrant shrikes (*tyrannus*) have the plumage of white and black, variously blended; but in the genus *tyrannula*, which approaches more to fly-catchers, the plumage is almost always olive-colored, serving for their concealment among foliage.

TYRCONNEL, RICHARD TALBOT, Duke and Earl of, b. early in the 17th century. In his youth, according to lord Macaulay, he was "one of the most noted sharpers and bullies of London." Soon after the restoration, he endeavored to obtain the favor of the royal family by blackening the reputation of Anne Hyde, so as to furnish the duke of York with a pretext for breaking his promise of marriage to her. Though unsuccessful in this, he succeeded in gaining the favor of the duke, and contrived to make himself welcome at the palace both as a votary of its pleasures and as a counselor in affairs of state. Immediately on the accession of James II., he was made earl of Tyrconnel and put in command of the troops in Ireland; and in 1687, by fawning, bullying, and bribing, he got possession of the office which had long been the object of his ambition—he was appointed lord-deputy of Ireland. His arrival in that country spread terror and dismay through the English Protestant population, who had already suffered somewhat under his military rule. Events quickly justified their terrors. Nearly every office of dignity in the country was soon transferred to the hands of the Roman Catholics. The Protestant party, so long dominant, complained bitterly that they had become a laughing-stock even to their own servants, and that to appeal to law was vain; judgment in every case being given for the native against the Englishman. But this state of matters did not last long. The revolution of 1688 had a sudden and sobering effect upon the rule of the lord-deputy; and there can be little doubt that he would have submitted to William III.; but the Irish people threatened that if he dared to sell them for wealth or honor, they would burn the castle and him in it, and put themselves under the protection of France. On the arrival of James in Ireland in 1689, he created the earl, duke of Tyrconnel. After the fatal battle of the Boyne, at which he held high command, he retired to France. In 1691 he returned to Ireland, with a view to furthering the efforts in favor of James, which were still being made by his adherents. Notwithstanding the defeat of Aghrim (July 12, 1691), and the capitulation of Galway, he made preparations for the defense of Limerick, binding himself and his countrymen by an oath not to surrender until they received permission from James, then at Saint Germain. He at the same time dispatched a letter in which he stated his conviction that all was lost. On Aug. 11, before an answer could arrive, he was struck with apoplexy. He died on the 14th of the same month. He has been characterized by Macaulay as "the fiercest and most uncompromising of all those who hated the religion and liberties of England." His wife, so famed for her beauty and fascinating manner, entered life as maid of honor to the duchess of York. As wife of the duke of Tyrconnel, during his rule in Dublin, her conduct seems to have been characterized both by dignity and purity. She died in a small private nunnery in Dublin in circumstances of great poverty. See Macaulay's *History of England*, vols. ii., iii., and iv.; Chambers's *Book of Days*, vol. i., ed. 1863, p. 310; Mrs. Jameson's *Memoirs of Beauties of the Court of Charles II.*, vol. ii., p. 223.

TYRE (Phen. *Sûr* or *Sôr*, rock), a city of ancient Phenicia, situated in lat. 33° 19' n., which probably derived its name from the double rock on which it was first founded. It was a matter of doubt among the ancients themselves whether Tyre or Sidon was the older of the two, and the question is not easily to be settled. So much, however, seems certain, that Tyre had existed already independently for a long time, when Sidon, defeated by Ascalon, transferred herself almost bodily to the former (see PHENICIA). There were two towns of Trye closely connected together in historical times; one on the continent, the other on the island opposite, together embracing about 19 Roman miles. The more important of the two was the continental town, called Palæ Tyrus; while the island-town served more or less for the purpose of store-houses, manufactories, arsenals, and the like. The situation of the entire city was one of the most fertile, and its magnificent combination of land and sea scenery formed the theme of many an ancient poet and seer.

Nothing but myths have come down to us respecting the earlier period of its existence. History begins to dawn upon us with Abibal, the predecessor of the biblical Hiram, under whose rule (980–47 B.C.) Tyre attained to its full glory and renown. An alliance with Solomon was also entered into; trading expeditions were undertaken jointly by the Israelites and the Phenicians, and Solomon is supposed even to have married Hiram's daughter. During Hiram's reign, Tyre was much enlarged and embellished; and its two roadsteads and harbors, the wonders of the ancient world, probably date from the same period. He was followed, according to ancient writers, by Balæastartus; after him reigned, for brief periods, his four sons, by the murder of the last of whom the throne became hereditary in the house of Ithobaal, the Ethbaal of Scripture, whose daughter was married to Ahab. Tyre then appears to have gained the supremacy over Sidon, and also spread her colonies far and wide. Shortly after the death of this king, Carthage was refounded by Elissa (Dido), about 813 B.C., in consequence of a popular demonstration, which deprived her of the throne in favor of Pygmalion. This "new city" gradually diminished the importance of the old one; at least Tyre seems to have been weakened to such an extent by the emigration of its best elements, that it disappears from history until the three great powers, Chaldaea, Assyria, and Egypt, by turns endeavored to make themselves masters of the Tyro-Phenician coast, with its eastern and western trade. Shalmaneser, king of Assyria, reduced Tyre, after a long siege; and the whole of Phenicia, the most important places of which had already

thrown off their allegiance to Tyre, was rendered tributary to Assyria. During the Chaldeo-Egyptian struggle, Tyre, again at the head of the country, sided with Egypt, and was conquered by the Chaldeans. Once more the Phenicians attempted to throw off the foreign yoke, and Nebuchadnezzar marched against them at the head of his armies. Having taken Jerusalem (587 B.C.), he reduced the whole sea-coast, except Tyre, which stood a thirteen years' siege by water and by land, ending, not in subjection, but only in a kind of apparent submission, leaving the native sovereigns on their thrones, and their wealth and power untouched. In 538 B.C., Cyrus became master of Phenicia, which at that time again stood under Babylonian supremacy, and the hegemony was bestowed upon Sidon. For a long time, Phenicia prospered under wise Persian rulers; but when Xerxes, in his Greek wars, had completely destroyed the Phenician fleet, and exhausted nearly all her resources, the exasperated inhabitants rose once more, but only to be utterly crushed. Sidon, at the head of the revolution, was fired by its own inhabitants, and once more Tyre resumed the lead (350 B.C.). Having refused to pay allegiance to Alexander the Great (after the battle at Issus), it was besieged by him in 332 B.C., and fell after a seven months' hard resistance. Alexander replaced the old inhabitants by new colonists, chiefly Carians, and though the city had sustained all but complete destruction, it yet rose again after a very brief period to wealth and power, and already in 315 B.C., was able to hold out for 18 months against Antigonus. Under the Romans, Cleopatra received Tyre as a present from Antony; but the last trace of its independent existence was taken from it by Augustus. A Christian community was founded there at an earlier period. The trade and manufactures of Tyre, aided by her exceptionally favorable naval position, insured for it, even under Roman dominion, a high place among its sister cities; and once more, in 193 A.D., it even took an active part in the contest between Septimius Severus and Pescennius Niger, which, resulting in the success of the former, brought back to it some of its ancient distinction. In St. Jerome's time, it was again the noblest and most beautiful city of Phenicia, nay, one of the most prosperous and noble cities in the whole east. In the 7th c., it came under the dominion of the Saracens, and so remained until taken by the crusaders; and in 1192 A.D. became the northern boundary of Christian territory in Palestine. It continued to flourish—still chiefly through its world-renowned purple—until 1516 A.D., when the conquest of Selim I., together with the newly discovered route to Asia by the cape of Good Hope, put an end to its wealth and commerce, and almost to its existence. Although there has been a slight improvement in its prospects of late, the desolation and wretchedness of that once magnificent city are still most striking. From 3,000 to 4,000 inhabitants now dwell among the ruins of its ancient glory, finding scanty livelihood in insignificant exports of tobacco, cotton, wool, and wood. Frederick Barbarossa and Origen are both buried here.

TYRNAU or **TIRNAU** (Magyar *Nagy-Szombat*), a t. of Hungary, co. of Ober-Neutra, on the river Trna, about 30 m. n.e. of Presburg. It has a cathedral dating from 1389, a large episcopal palace, and numerous churches and convents. Tyrnau carries on manufactures of cloth, linen, woad, etc., and has a tolerably lively general trade, especially in wine. From 1635 to 1777 it possessed a university, which in the latter year was transferred to Pesth. Tyrnau is likewise famous for a huge cask, which can hold twice as much as the great Heidelberg one. Pop. '90, 11,500.

TYRNAVO, a town in Greece, near the Turkish frontier, 11 m. n. of Larissa, and s.e. of the Reveni pass. Pop. about 5300. Tyrnavo came into prominence during the Græco-Turkish war of 1897, when, after the capture of the Milouna pass by the Turks, the fighting continued for several days around the town, until, on the night of April 23, Crown Prince Constantine found it necessary to abandon Tyrnavo, the retreat in utter darkness soon becoming a disastrous rout. Large military supplies fell into the hands of the Turks.

TYROL (in German more commonly spelled *Tirol*; not spoken of as *das Tirol*, though usually called in England *the Tyrol*) forms with Vorarlberg the most westerly province of the Austro-Hungarian monarchy, and borders n., w., and s. on Bavaria, Switzerland, and Italy. Area, including Vorarlberg, 11,324 sq.m.; pop. '90, 928,769.

Surface.—The Tyrol may be regarded as an eastern continuation of Switzerland. It is traversed from e. to w. by the great chain of the Alps, and is encircled on all sides by lofty ranges. It consists, however, almost entirely of three great valleys—(1) one running e. and w. n. of the great Alps, and drained by the Inn; (2) one s. of the Alps, also running e. and w., and drained by upper tributaries of the Adige or Etsch; (3) one running s. from the middle of the last, and drained by the main stream of the Adige. These valleys are surrounded by a circuit of mountains. The northern valley is separated from Bavaria by the Algau Alps. The southern valley is bounded on the e. by the Trent Alps; on the w. by the Ortler Alps, which, like protecting walls, run s. into the plain of Lombardy. The main chain is crossed toward the center of the Tyrol by a deep depression, in which lies the Brenner pass (elevation, 4470 ft.). It is the lowest of the great passes of the Alps, and that over which runs the great commercial route connecting Italy and Germany.

The dialect and manners of the Bavarians prevail in the northern and middle valley. The dialect and manners of Lombardy, on the other hand, have crept up the third valley to a boundary-line which rests upon the mountains which bound the middle valley

on the south. Hence the most important divisions of the Tyrol are into the German Tyrol and the Italian Tyrol. The German Tyrol is divided into (1) the Oberinntal, or the Upper Inn valley; (2) The Unterinntal, or the Lower Inn valley; (3) the Vintschgau; (4) the Etsch district; and (5) the Pusterthal, the three last belonging to the middle valley of the Tyrol. Beyond the geographical limits of the Tyrol the Austrian province of the Tyrol includes (6) the Vorarlberg, a district drained by streams which fall into the lake of Constance, and in which a dialect is spoken resembling those of German Switzerland; and (7) the Lienz district, on the Drave, in which the language of the people is Austrian. The Italian Tyrol is divided into (1) a northern valley, or that of Trent; (2) a southern valley, or that of Roveredo; (3) the valley of the Sarca, or district of Riva, on lake Garda.

Geology and Soils.—The rocks of the Tyrol are chiefly crystalline Silurian and secondary, with obtruding granites and traps. The chief mineral products are iron, rock-salt, worked near Innsbruck, and marble, quarried in the south, silver, copper, lead, zinc, and sulphur are also extracted. The tertiary strata of the Swiss and Swabian plains are totally wanting; and it is only along the water-courses that level tracts of recent formation are found. These tracts are the only parts of the country admitting of cultivation by the plow, and seldom attain a width of more than half a mile. Taken altogether they form barely one-tenth of the whole country.

Climate.—The loftiest mountains of the Tyrol are in the main chain of the Alps—the Gross Glockner (12,460 ft.), e. of the Brenner pass, and mount Gebatsch (12,276 ft.) w. of it and, in the Ortler chain, the Ortler Spitz (12,818 ft.). These mountains are covered with vast glaciers, which descend, like those of Switzerland, far into the valleys. Between 6000 and 5000 ft. snow disappears in summer, and Alpine plants and grass cover the hills, diversified here and there with stunted bushes. Into this region the herds are driven, as in Switzerland, during the summer months. Below 5000 ft. the firwoods abound; potatoes and a few vegetables are cultivated, and houses permanently occupied make their appearance. The beech replaces the fir at 4000 ft. and agriculture begins, the chief grains being rye and barley. Wheat is not cultivated with success at a higher elevation than 2000 feet. In the lower part of the southern valley, the temperature is highest, and tobacco, the fig, the olive, and the mulberry are cultivated. Out of every 100 acres of the Tyrol, 30 are inaccessible mountain-tracts, 40 forests, 20 commons and meadows, and 10 corn-fields and gardens.

Industry.—The industry of the Tyrol is not important. There are, however, glass and paper factories near Innsbruck; and carpets, linens, gloves, and straw hats are manufactured extensively for home consumption. Wooden ware is also largely produced. The rearing of canaries is a business which was long a monopoly of the northern Tyrolese, who supplied all Europe with these birds. The exports from the Tyrol consists of cattle, cheese, timber, wine, tobacco, silk, iron, and salt. The imports are grain and manufactured goods. The transit-trade between Italy and Germany gives employment to a large number of the inhabitants. Thousands migrate annually into neighboring countries, to sell their wood wares, gloves, and carpets. Railways have for a number of years connected Innsbruck with Munich, and Botzen with Verona; and in 1867 the section between Innsbruck and Botzen, over the Brenner pass, was opened, which completed the first railway communication between Italy and Germany. Numerous lines have been built in recent years, and the total length of roads in operation in 1896 amounted to over 442 miles.

Inhabitants.—The northern or German Tyrolese bear to the southern or Italian, the proportion of three to two; and the habits and language resemble those of the adjoining parts of Italy and Germany. In the Tyrol, according to the census, the inhabitants are all Catholics, with the exception of 358 Jews, 1235 Protestants, 29 Greek Christians, and a few members of other sects. The Tyrolese have an independent national diet, meeting at Innsbruck, in which are represented all classes of the population, the clergy, the nobility, the people of the country, and those of the towns. There are, to some extent, separate administrative arrangements for the Italian districts. Education is now very generally diffused, and one of the nine Austrian universities is at Innsbruck.

History.—The history of the Tyrol is partly German and partly Italian. In early times the Tyrol formed part of Rætia, and was conquered by the Romans, 15 B.C. Subsequently it was overrun by various German tribes; still later the southern valley fell to the share of the Lombards, the two northern valleys to the Bavarians. The latter valleys were divided into *gaus*, which ultimately became petty lordships, acknowledging the supremacy of the dukes of Bavaria. These lordships, however, in the course of time, came to be represented by two families who intermarried. Then the whole German Tyrol was governed by one family of counts, whose paternal abode was the mountain fortress of Terioli, or Tyrol, near Meran. The last count, who died in 1335, left one daughter, Margaret Maultasche. She bequeathed her rights to her cousins, the dukes of Austria, who, in consequence, acquired possession of the Tyrol in 1363. The Italian valley formed the bishopric of Trent. During the wars of Napoleon, the German Tyrol was ceded to Bavaria, much to the discontent of the population, who were warmly attached to the house of Austria. They made a gallant resistance to the French in 1809, under Andreas Hofer, but were defeated; and the northern Tyrol was not restored to Austria until the treaty of Paris in 1814. The southern Tyrol, which had been annexed to Italy, was restored to Austria in the following year. An application was

made by the inhabitants of the Italian Tyrol, a few years ago, to the Austrian government to be rendered entirely independent of the German inhabitants of the northern valleys; but it led to no important change in the administration. It showed, however, the desire of the southern Tyrolese to be considered Italians rather than Germans, and it was believed that on the event of a successful war for the recovery of Venice, the whole of the southern Tyrol would be handed over to the kingdom of Italy. This expectation has not been realized. By the treaty of peace between Austria and Italy at the conclusion of the war through which Venetia again became Italian, it is declared that the frontiers of the Venetian provinces ceded to Italy are the administrative frontiers of these provinces under the Austrian rule. Even the shores of lake Garda remained Austrian. How long this arrangement will last, it is hard to predict. The trade of the southern Tyrol is entirely with the south, its wood and cattle being exchanged for the corn of Lombardy, and it is asserted that if any attempt is made to enforce custom-house regulations on the frontier, the inhabitants will not rest satisfied until they have secured the annexation of their territory to Italy.

TYROLIENNE, a species of Ländler waltz. The Tyrolienne never had a distinctive existence as a dance. It is best heard in the Ziller Thal, in Switzerland. A characteristic feature as sung in the Austrian and Bavarian Tyrol is the Jodel, the term applied to the rapid changes from the chest voice to the falsetto. These adorn all Tyrolean melodies. A good example of a Tyrolienne is the Chorus Tyrolien in Rossini's *Guillaume Tell*. See Spaun's *Oesterreichischen Volksweisen* (Vienna, 1845); Süss-salzbürger, *Volkslieder* (Salzburg, 1865), and von Kobell's *Schnadahuffeln* (Munich, 1845); and Moscheles, *Tyrolese Melodies* (1827).

TYRONE (*Tir-owen*, "Owen's country"), an inland co. of Ulster, Ireland, bounded n. by Londonderry, e. by Armagh and lough Neagh, s. by Monaghan and Fermanagh, and w. by the last-named county and Donegal. A portion of lough Neagh is assigned by the ordnance survey to this county; and, including this portion, the whole area is 1260 sq. m., or 806,400 acres, of which 9672 acres are woods and plantations. The principal rivers of Tyrone are the Blackwater, the Camowen, and the Ballinderry, of which the two former are navigable. The county is traversed by railways, which connect it with Dublin, Belfast, and the sea-coast at Dundalk. The geological structure is very much diversified. The north-western mountains are chiefly mica-slate with primitive limestone, and rise in Slieve Sawel to a height of 2236 feet. Those on the n.e. are of greenstone, with granite and occasional red sandstone. The plain, of which Omagh is the center, is a tertiary formation, with irregular beds of lignite, red marl, and new red sandstone; and between Dungannon and Stewartstown there is a small coal-field, the produce of which is rich, and resembles the coal of Ayrshire. The rest of the plain belongs to the general limestone district. The climate is moist, and the low lands are often flooded. The soil of the plain is a fertile loam; that of the hilly districts sandy, or gravelly. There are manufactures of linens and coarse woollens and earthenware; besides breweries, distilleries and flour mills. Pop. 91,171,701.

The chief towns are Omagh, Strabane, Dungannon, Cookstown, Aughnacloy, Castle-derg, and Clogher, which gives its name to the Episcopal see. Tyrone returns four members to the imperial parliament.

Tyrone was anciently known as the district of Hy-Briun and Hy-Fiachra; and in later Celtic times was called Kinel Eogain, or Tir-owen, whence its modern name. See **ULSTER**.

TYRRELL, a co. in e. North Carolina, bounded on the n. by Albemarle sound; 380 sq. m.; pop. '90, 4225. Co. seat, Columbia.

TYRRHENIAN SEA (anc. *Tyrrhenum mare*), that part of the Mediterranean sea (q. v.) between the islands of Corsica, Sardinia, and Sicily on the w., and the Italian peninsula on the east.

TYRTÆUS, famed for his political elegies and marching-songs, was the son of Archembrotus, of Aphidnæ, in Attica; according to another conjecture he was a Lacedæmonian; while the story which represents him as a lame schoolmaster, of mean family, whom the Athenians (ignorant of his lyric power, and jealous of Lacedæmonian domination in the Peloponnesus) sent to the Lacedæmonians, during the second Messenian war, as the most inefficient commander they could select, must be received as a fiction of later times. He rendered, however, to the Lacedæmonians a kind of assistance which the Athenians little foresaw; and while by his elegies he stilled their dissensions at home, by his war-lyrics he so animated their courage in the field that they were finally triumphant in their conflict with the Messenians, whom they reduced to the condition of helots. This success of his poems Tyrtæus lived to see, and must accordingly have flourished down to 668 B.C., the last year of the second Messenian war. The best edition of the text of Tyrtæus is that of Bergk in his *Poeta Lyrici Græci*.

TYRWITT, THOMAS, 1730-86; b. England; educated at Oxford. He became under secretary of war in 1756, and clerk of the house of commons in 1762, resigning in 1768. He was appointed a curator of the British Museum in 1784. Among his works are *Observations on some Passages in Shakespeare* (1766); and an edition of Chaucer's *Canterbury Tales* (1775-78).

TYTLER, ALEXANDER FRASER, a historical writer, and a judge of the court of sessions in Scotland under the title of lord Woodhouselee. He was the eldest son of William Tytler (q.v.), the vindicator of Queen Mary, and was born at Edinburgh in 1747, educated principally in Edinburgh, and admitted to the Scottish bar in 1770. He obtained, in 1780, the professorship of history in the university of Edinburgh; in 1790, the office of judge-admiral of Scotland; and in 1802 was raised to the bench of the court of session. His acquirements were of the most varied kind, embracing most departments of literature and the fine arts. His writings include a biography of Henry Home, lord Kames; a Dictionary of Decisions of the Court of Session; and the work by which he is best known, his *Elements of General History*, first published in 1801, which has been translated into most of the languages of Europe, and even into Hindustani. He died in 1813.

TYTLER, PATRICK FRASER, an eminent historical writer, fourth son of Alexander Fraser Tytler, lord Woodhouselee. He was born in 1791, educated partly in Edinburgh, partly in England, and called to the Scottish bar in 1813. Of his various literary and historical works the most valuable is his *History of Scotland*, beginning at the accession of Alexander III., and terminating at the union of the crowns—a book of more critical research than any work on the same subject that had preceded it. His writings also include a life of the admirable Crichton, a life of Wyckliffe, a memoir of sir Thomas Craig, and a collection of original letters, illustrative of the reigns of Edward VI. and Mary. In consideration of his merits as a historian, sir Robert Peel's government conferred on him a pension of £200 a year. He died at Malvern Dec. 24, 1849. His talents were such as qualified him in a remarkable degree to shine in society, and his amiable and excellent private character have been the subject of deserved eulogy.—See Burgon's *Life of Patrick Fraser Tytler* (1859).

TYTLER, WILLIAM, the author of several literary works of considerable merit, the principal being an *Inquiry, Critical and Historical, into the Evidence against Mary Queen of Scots*, in which it is attempted to vindicate that unhappy princess from the charges brought against her by Robertson and Hume. Tytler was born at Edinburgh in 1711, educated in Edinburgh, admitted a member of the society of writers to the signet in 1742, and died in 1792. He was father of Alexander Fraser Tytler, lord Woodhouselee, and grandfather of Patrick Fraser Tytler, the historian. Tytler was an accomplished musician, and distinguished for his general culture and taste in the fine arts.

TZETZES, JOHANNES, a Byzantine (Greek) author, flourished during the latter half of the 12th c., is known as the author of certain works in prose and verse, which, though excessively dull, and without a vestige of literary genius, are valuable as store-houses of classical information, not elsewhere to be had. The principal are—1. *Iliaca*, consisting of three distinct poems, entitled *Ante-Homerica*, *Homerica*, and *Post-Homerica*; or in Greek, *Ta pro Homerou*, *ta Homerou*, *kai ta methi Homerou*; a complete edition of which was first published by Fr. Jacobs (Leip. 1793); but the most critical edition is that of Bekker (Berl. 1816). 2. *Biblos Istorike*, more commonly called *Chiliades*, or a collection of more than 600 stories—mythical, legendary, etc.; best edition that of Kiessling (Leip. 1826), written in that worthless sort of verse called *political*, which had regard only to syllables, and not to quantity; besides commentaries on Homer, Hesiod, and the *Cassandra* of Lycophron. Several poems and commentaries of Tzetzes exist in MS. that have never yet been published.—Tzetzes had a brother—ISAAC—who probably had some share in the commentary on the *Cassandra*.

TZAR. See **CZAR**.

TZSCHIRNER, HEINRICH GOTTLIEB, 1778–1828; b. Mittweida, Saxony; studied theology at Leipsic; ordained to the ministry, 1801; professor of theology, Wittenberg, 1805; at Leipsic, 1809; superintendent at Leipsic, 1815; prebendary of Meissen, 1818. He strongly opposed Roman Catholic reaction in Germany. He published *Protestantismus und Katholicismus aus dem Standpunkte der Politik betrachtet*; translated into English, French, and Dutch, *Das Reactionssystem*.

U

U, THE twenty-first letter of the English alphabet, represents in that language three distinct sounds, as heard in *tube*, *tub*, and *full*. The last is its primitive sound, which it had in Latin, and which it has preserved in German and Italian, but which is oftener denoted in English by *oo*. In *tube* it does not mark a pure vowel sound; it is aspirated, as if *y* were prefixed—*tyub*. The sound heard in *tub* is characteristic of English; and, owing, perhaps, to the decided emphasis given to one syllable of a word at the expense of the rest, there is a tendency to allow the other vowels, *a*, *e*, *o*, when unaccented, to degenerate into this indistinct, stifled sound: *cavalry*, *sister*, *fashion* are pronounced almost, if not altogether, as if written *gavulry*, *sistur*, *fashun*. This is especially the case with *o*; and in this vowel the degeneracy is not confined to unac-

cented syllables; in a whole host of words the accented *o* is exactly equivalent to *ü*—e.g., *come, money, among*. Perhaps a similar tendency in Latin may account for the prevalence of *u* in that language as compared with Greek—e.g., Lat. *genus* = Gr. *genos*; *volumus* = *boulometha*; *spatula* = *spatale*; *scopulus* = *skopelos*. *U*, in Latin, sometimes goes into the still thinner sound of *i*; thus *maximus, caputis*, degenerated into *maxinus, capitis*. Of the labial series of vowels (see LETTERS), *u* approaches nearest to the labial consonants; so much so that in Latin the vowel *u* and the consonant *v* were both denoted by the same character, *v*, of which *u* is only a later modification. In the middle ages the two characters were used indifferently whether as vowel or consonant; and it was only in the 16th c. that the Dutch scholars fixed the use of the character *u* for the vowel, as distinct from *v*.

UBE'DA, a t. of Spain, Andalusia, in the modern province of Jaen, stands on an olive-clad slope in a cultivated plain, 26 m. n.e. of the town of Jaen. It contains some fine specimens of architecture, of which the chief is the cathedral. It was built by the Moors, and under them it is said to have contained 70,000 inhabitants. There were in 1887 only 18,713, who were engaged in agriculture, in the manufacture of pottery, leather, soap, and woolen goods, and in trade in grain, wine, figs, and oil.

UCAYALI, a great river of South America, one of the chief head-waters of the Amazon. It joins the Amazon from the s., in s. lat. 4° 40', and w. long. 73° 30', opposite the town of Nauta in Ecuador; but the whole course of the river is in Peru. It is the largest river that joins the Amazon above the Brazilian territory, and on account of its length, has been regarded by some as the main stream of the Amazon, but at its mouth it is not above half the width of the Amazon. It is formed by the union of the Apurimac, Mantaro, Paucartomba and Vilcamayu, which all have their source in or near the eastern side of the western cordillera, and break through the Andes in narrow cañons. Taken together, these rivers water the finest and most thickly populated part of Peru, and all become navigable after passing the Andes. In Peru the name Ucayali is not applied to any of the head-waters, but only to the united flood, which lies wholly in the lowlands. Its course is winding but preserves a general northerly direction. Its total length is estimated at upwards of 1000 miles, affording means of communication between the western parts of Peru and the Atlantic ocean. It was partially explored by the count de Castelnau and others in 1846, by lieut. Herndon and Mr. Gibbon of the U. S. navy in 1851, and more recently by an expedition sent out by the Peruvian government. It has been found to be navigable by steamers from its mouth to towns not far distant from Lima, 3700 m. from the mouth of the Amazon. On the Apurimac, which rises in the neighborhood of the town of Cuzco and, after cutting through the Andes, joins the Mantaro, there are falls and rapids which form an impediment to navigation more than 100 m. below Cuzco. The greater part of the country through which the Ucayali flows is covered with forest and is frequented only by gatherers of rubber, and by a few wild Indians, but it seems very suitable for colonization, if easy communication with the rest of the world were established, the soil being fertile, while the mountains abound in valuable minerals. Compare Castelnau, *Expédition dans les Parties Centrales de l'Amérique du Sud* (1851); Löffler, in *Petermanns Mittheilungen* (1886, pt. 1).

UCHEES, a tribe of American Indians, inhabiting the shores of the Savannah river as far s. as its confluence with the Ogeechee. During the troubles which culminated in the Yemassee war, they moved to the Chattahoochee country, and as members of the Creek confederacy were given a reservation in the Indian territory, retaining their original language and customs.

UDALL, or **WOODALL**, NICHOLAS, 1505-56; b. England; graduated at, and fellow of Corpus Christi college, Oxford; was zealous for the reformation; master of Eton, 1534-43, noted for severe discipline, and dismissed for removing silver images from the chapel; vicar of Braintree; rector of Calbern; canon of Windsor, 1551-56; head master of Westminster, 1555. He wrote several Latin and English plays to be performed by his pupils, one of which, *Ralph Roister Doister*, is the earliest English comedy known to be extant, being identified as such by a quotation from it in *Wilson's Logic*, 1551. He was also the author of some other poems and of several school books.

UDAL RIGHT, in the law of Scotland, means that right in land which may be completed without charter and sasine by undisturbed possession provable by witnesses before an inquest. Though dependent on the crown as superior, the vassal pays only a tribute called skat. The right is said to have been the old tenure prevalent in Britain before the feudal system was introduced, and prevails chiefly in Orkney and Shetland. The lands held on udal right are now commonly converted into feus.

U'DINE, a province of Venetia in n.e. Italy, adjoining Austria and lying on the Adriatic sea; 2541 sq. m.; est. pop. '95, 532,359; drained by the Tagliamento and lesser rivers. The surface is low and marshy in the s., but rugged in the n.; the chief occupation is the production of silk, of which large quantities are exported.

U'DINE, a city of n. Italy, Venetia, in the province of the same name, situated in a fertile plain, about 75 m. n.e. of Venice by railway. It is a walled town, 4 m. in circumference, with wide, handsome streets and squares. The castle, which stands on a

hill in the midst of the city, was formerly the residence of the patriarchs of Aquileia, and is now the seat of the tribunals. The principal object of interest in Udine is its *Campo Santo*, regarded as one of the most beautiful cemeteries in Europe. Udine trades in silk, in copper utensils, and rosoglio. There are leather, paper, and silk factories. Two miles from Udine stands the village of Campoformio, where, in 1797, the treaty between Bonaparte and Austria was signed, by which Venice was ceded to the latter. Pop. '95, commune, 37,200.

UEBERWEG, FRIEDRICH, b. Prussia, 1826; educated at Göttingen and Berlin, and in 1862 was made professor of philosophy at Königsberg. He wrote a work on logic, and a standard history of philosophy, translated in America by Prof. G. S. Morris, etc. He d. 1871.

UFA, a government of Russia, formed in 1865 out of the five n.w. districts of Orenburg, and separated from the present government of Orenburg by the s.w. branch of the Ural mountains. Area 47,112 sq. m. Pop. '94, 2,156,939. See ORENBURG.

UFA, capital of the government of the same name, on the right bank of the Biëlaia, or White River. It was built in 1573, in the reign of Ivan IV. It contains numerous churches, a library and museum, a theater, and many manufactories, the principal articles of trade being honey, wax, fat, furs, and skins. The Biëlaia, an affluent of the Kama, and thus connected with the Volga, is here navigable for large ships. Pop. '97, 50,576.

UGANDA, a vast tract of country in Central Africa lying on the w. and n.w. banks of lake Victoria Nyanza, about 600 miles from the coast, with an area of about 90,000 sq. miles, and a population variously estimated at from 300,000 to 500,000. It is part of the British territory allotted to England by the Anglo-German agreements of 1886 and 1890. The region was opened up at the same time with Somali, the Equatorial province, Usoga, etc., by the imperial British East Africa Company, who, in 1888, obtained a concession of territory from the Sultan of Zanzibar and a charter from the British government. In 1895 the government took over the administration from the company and made the country a protectorate. It is a fertile region and the climate is fairly healthy in spite of the heavy annual rain. The natives are known as the Waganda, a tribe of the Bantu race, under the nominal rule of King Mwanga. The civil administrator of the protectorate is Mr. E. L. Berkeley. An active missionary propaganda has been carried on of late years, the Protestants and Catholics each claiming about 3000 converts. The capital is Mengo, near which is the British fort Kampala. The development of the country has progressed rapidly in the last two years, but outside trade will be impossible until the completion of the projected railroad to Victoria Nyanza, begun in 1895, which is to have its terminus at Port Victoria, 140 miles east of Mengo by road, and 100 by the lake.

UGLITCH, a t. of Great Russia, in the government of Jaroslav, on the right bank of the Volga, 488 m. s.e. of St. Petersburg. In early times it was the chief town of an independent principality of the same name. After the assassination at Uglitch of Prince Dmitri, son of Ivan IV., in 1592, the majority of the inhabitants of the town were banished to Siberia and other distant quarters, and the town, formerly prosperous, became deserted. Uglitch contains 24 churches, 2 cloisters, and numerous manufactories—linen weaving, and tanning being the principal branches of industry. Pop. '93, 12,769.

UGOCSA, a co. in n.e. Hungary, in the trans-Tibiscan circle; 458 sq. m., pop. '90, 75,461. Capital, Nagy-Szöllös.

UGRIANS, a Finnish people living in the district of Tobolsk, Siberia. They live a wandering life, supporting themselves by fishing and the chase. Though professedly Christians, their religious belief is a cross between Christianity, Shamanism, and Moham-medanism. Their language is a Finnic dialect.

UHLAND, LUDWIG, a celebrated German poet, was born at Tübingen, April 26, 1787, studied at the university of his native city, and first appeared as a writer of verse in Seckendorf's *Musen-almanach* (1807-8). For several years he continued to publish ballads and other lyrics in various periodicals, the first collection of which, under the title of *Gedichte*, appeared in 1815. To this he kept adding all the rest of his life, and it is on these *Gedichte* that his fame rests. Their popularity has been, and continues to be, as great as it is merited, upward of a dozen editions having been published. Other productions of Uhland's are his admirable essays, *Ueber Walther von der Vogelweide* (Stuttg. 1822), and *Der Mythos vom Thor nach nordischen Quellen* (Stuttg. 1836); a masterly collection of old popular songs, *Alter hoch- und nieder-deutscher Volkslieder* (Stuttg. 1844-45); and two dramas, *Herzog Ernst von Schwaben* (Heidelb. 1817), and *Ludwig der Bayer* (Berl. 1819). He died at Tübingen, Nov. 13, 1862. Uhland was a patriotic politician as well as a poet. He entered the representative assembly of Würtemberg in 1819 as a deputy from Tübingen, and proved an active member of the liberal party. He was also a delegate to the Frankfort assembly of 1848; but though Germany has reason to be grateful for his services to the cause of constitutional liberty, it is as a poet he will be best remembered. His pieces are full of

spirit, imagination, and truth, finely picturesque in their sketches of nature and exquisite in their varied tones of feeling. Nothing, indeed, can surpass the brevity, vigor, and suggestive beauty of his ballads, in which a romantic sweetness of sentiment and a classic purity of style are happily combined. Uhland is the acknowledged head of the "Swabian school" of German poets. See Pfizer's *Uhland and Rückert* (Stutt. 1837), and Mayer's *Uhland* (1867). Longfellow has translated some of Uhland's ballads, in his *Hyperion*, into English; and translations by Platt, Skeat, and Sanders have also appeared.

UHLANS (a Polish word signifying "lancers"), light cavalry of Asiatic origin, were introduced into the n. of Europe along with the colonies of Tartars who established themselves in Poland and Lithuania. They were mounted on light active Tartar horses, and armed with saber, lance, and latterly with pistols. Their lance was from 5½ to 6½ ft. in length, and, like that of the modern "lancers," was attached to a stout leather thong or cord, which was fastened to the left shoulder and passed around behind the back, so as to allow the lance to be couched under the right arm. Immediately below its point was attached a strip of gaudy-colored cloth, the fluttering of which was designed to frighten the enemies' horses. The early dress was similar to that of the Turks, and the regiments, or *polks*, were distinguished from each other by the red, green, yellow, or blue color of their uniforms. The Austrians and Prussians were the first to borrow this species of cavalry from the Poles. In 1734 an attempt was made by Marshal Saxe to introduce the uhlands into France, and a "polk" of 1000 men was formed; but it was disbanded at its author's death. The Prussian uhlands won great renown in the Franco-German war of 1870-71 by their bravery and marvelous activity. The Prussians applied the term, however, rather loosely, including all their light cavalry under the designation.

UINTA, a co. in Utah; formed 1880. Pop. '90, 2762. Area, 5834 sq.m. Co. seat, Ashley.

UINTA, a co. in w. Wyoming, containing Fremont's peak, the greater part of the Yellowstone national park, and the Uinta mountains; 14,830 sq. m.; pop. '90, 7881, chiefly of American birth, with colored. The direction of the Uinta range is nearly e. and west. It is composed of broad plateau-like masses carved into integral blocks or subdivided into many parts. The rocks are quartzites, sandstones, carboniferous limestones, etc. They continue over the border of Utah from the Wahsatch range. Among the highest peaks are Dawes peak, Cox's peak, and Logan's peak (10,004 feet above sea-level). Co. seat, Evanston.

UIST, **NORTH** AND **SOUTH**, two islands of the outer Hebrides, are situated from 15 to 18 m. w. of the isle of Skye, from which they are separated by the little Minch. Unlike the other islands of the Hebrides, the e. coasts of North and South Uist are much and deeply indented, while the w. coasts are, as a rule, almost unbroken.—**NORTH UIST**, between which and *South Uist* the island of Benbecula intervenes, is 18 m. long from w. to e., and from 10 to 3 m. in breadth. The eastern half of it is so cut up by lochs and water-courses as to have the appearance of an archipelago. This region is a brown, peaty, dreary bog, partly relieved, however, by a line of low hills running along the coast at the distance of about 2½ miles. In the w. part, which, as a rule, is hilly, there is a tract of uneven, low land, exceedingly beautiful in certain seasons, rendered fertile by the drifting of shell-sand from the coast, and producing good clover and grain crops. Pop. '81, 3,371.—**SOUTH UIST**, 20 m. long, and 7 m. broad. Its e. coast is much indented by the lochs Skipport, Eynort, and Boisdale. The eastern district is upland; the western is alluvial and productive, under proper treatment. Pop. '81, 3,825, engaged, like the inhabitants of North Uist, in fishing and agriculture.

UJEIN', one of the seven sacred cities of Hindustan, in Sindia's dominions, of which it was formerly capital, stands on the right bank of the Sipra, 35 m. n.n.w. of Indore. It is surrounded by walls with round towers, is six m. in circumference, contains the grand palace of the head of the Sindia family, several mosques and mausoleums, an observatory, and an antique gate, supposed to date from before the Christian era. An active trade is carried on in cloths, opium, etc. The number of the inhabitants is estimated at about 100,000.

U'JHELY-SÁTORALYA, or **SÁTORALYA-U'JHELY**, a market-t. of Hungary, 105 m. n.w. of Pesth. It stands on the Hegyalya mountains, contains several churches and a gymnasium, and is noted for its wine-culture. Pop. '90, 13,017.

UJI'JI, a t. in Africa, capital of a small region of the same name, on the e. shore of lake Tanganyika; pop. 8000. It is divided into two parts, Ugoy, inhabited by Arabs, and Kawele, by the natives. Here Stanley found Livingstone, Nov. 10, 1871.

UKASE', or **UKAS** (Russian *ukasat*, to speak), a term applied in Russia to all the orders or edicts, legislative or administrative, emanating from the government. The ukases either proceed directly from the emperor, and are then called *imenny ukas*, or are published as decisions of the directing senate. Both have the force of laws till they are annulled by subsequent decisions. Many ukases are issued in the course of one reign; and as an immense chaos of ukases had accumulated since 1649 (the date of the last codification of laws), the Czar Nicholas ordered (1827) that a collation of them should be made. The result was a collection of laws in 48 volumes, which has been supplemented year by year by volumes of new ukases, and which, after the elimination

of such ukases as are unimportant or of temporary authority, constitutes the present legal code (*swod*) of the Russian empire. The *prukases* are imperial "orders for the day," or military orders given during the campaign.

UKRAINE (Slav. a frontier country or march), the name given in Poland first to the frontiers toward the Tartars and other nomads, and then to the fertile regions lying on both sides of the middle Dnieper, without any very definite limits. The Ukraine was long a bone of contention between Poland and Russia. About 1686 the part on the e. side of the Dnieper was ceded to Russia (Russian Ukraine); and at the second partition of Poland the western portion (Polish Ukraine) also fell to Russia, and is mostly comprised in the government of Kiev. The historic Ukraine forms the greater part of what is called little Russia (a name which first appears about 1654), which is made up of the governments of Kiev, Tchernigov, Poltava, and Kharkov.

ULCERATION is "that part or effect of an inflammatory process in which the materials of inflamed tissues liquefy or degenerate, are cast off in solution or very minute particles from free surfaces, or, more rarely, are absorbed from the substance of the body."—Paget on "Ulcers," in Holmes's *System of Surgery*, vol. i. p. 197. Generally speaking, however, the name of ulcer is not applied to any inflammatory result, unless the substance of a tissue deeper than the epithelial is exposed; and when the cast-off particles are only epithelial, the result is termed desquamation, abrasion, or excoriation, although the process may be essentially the same. Ulceration is closely allied to gangrene, the two processes differing in degree rather than in kind. "When the degenerate or dead substance," says sir J. Paget, "is cast off in one or more portions visible to the naked eye, the process is usually called gangrene; when the portions are not so visible, or are quite dissolved, it is called ulceration." The degenerate tissues are always suspended or dissolved in a liquid, termed the "discharge," or "ichor," which varies in appearance and properties according to the cause and characters of the ulcerative process. "From some ulcers, e.g., the primary syphilitic, it is contagious; from many, it appears corrosive, exciting by its acridity inflammatory changes in the tissues with which it is in contact."

ULCERS (derived from the Latin *ulcus*, a wound) may be arranged either according to the constitutional or specific disease from which they are derived, or according to the characters which they present. According to the first system, we speak of ulcers as healthy, inflammatory, strumous, etc.; while, according to the second, they are named irritable, chronic, sloughing, etc. In this article, we shall adopt the former of these arrangements, as being, upon the whole, the most satisfactory, although each possesses its own advantages.

A *common, simple or healthy ulcer* is such as is left after the separation of an accidental slough in a healthy person, and is merely a healthy granulating surface, tending to cicatrization. Its edges shelve gently down to the base, and are scarcely harder than the adjacent healthy skin. Their surface near the border is of a purplish blue tint where the young epidermis modifies the color of the healing granulations; and within this, the granulations have a deeper hue than those at the center, being most vascular where the cuticle is being chiefly developed. The discharge from such an ulcer is healthy or "laudable" pus. The only treatment required is a little dry lint, if there is much discharge; or the water-dressing, if the sore is comparatively dry. When the granulations are too luxuriant, they must be touched with nitrate of silver, and dressed with dry lint. *Inflammatory ulcers* differ less than most kinds from the above-described common or healthy ulcers. They commonly arise from some trifling injury, such as a blow or slight abrasion of the skin, which, to a healthy person, would have done no harm. Their most common seat is on the lower half of the leg or shin. The surface is red, and bleeds easily; the discharge is thin and watery; the edges irregular or shreddy; and the surrounding skin shows a red tinge, and is the seat of a hot and aching sensation. This ulcer most commonly occurs in the infirm and old, the ill-fed and overworked. Hence constitutional treatment, good diet, and complete rest (with elevation of the limb) are here demanded, in addition to water-dressing or lead-lotion applied warm. *Senile ulcers* usually present very little discharge, exhibit granulations of a rusty red tint, and are surrounded by a dusky red area. Nourishing food, wine, bark and the mineral acids are here required, and opium in small repeated doses is often serviceable. The local treatment must be of a stimulating nature; and in bad cases sir J. Paget recommends strapping the leg daily with a mixture of resin ointment and Peruvian balsam spread on strips of lint. *Strumous or scrofulous ulcers* usually occur as the consequence of scrofulous inflammation in the subcutaneous tissue or lymphatic glands. They most commonly occur in the neck, groins, cheeks, scalp, and the neighborhood of the larger joints. The discharge is thin, and of a greenish-yellow tint. These ulcers are seldom very sensitive or painful. The general treatment must be that recommended for constitutional scrofula (q.v.). Iodine, in some form or other, is the best local application. A poultice of bruised and warmed sea-weed is a very popular remedy; but there is probably nothing so efficacious as tincture of iodine diluted with water till it causes only a slight discomfort, and applied three or four times a day. (About 30 drops of the tincture may be added to an ounce of water to begin with.) Of the numerous other species distinguished by sir J. Paget, we shall briefly notice the

varicose, indolent, and sloughing ulcer. *Varicose ulcers* are connected with an enlarged or varicose state of the veins of the lower extremity, which weakens the parts, and renders them especially liable to ulceration. See **VARICOSE VEINS**. The *chronic, indolent, or callous ulcer*, beyond all doubt, gives more trouble to the poor-law medical officer and the workhouse surgeon than any other half-dozen surgical affections. It is usually seated in the lower half of the leg, and is most commonly of an oval form, with its long axis parallel to that of the leg. "Its base lies deep, and is flat, pale, or tawny and dusky, with very minute or no visible granulations. The margin is usually abrupt, or unequally shelving, and in its most characteristic form, strictly overlaid with opaque, white, dense epidermis."—Paget, *op. cit.*, p. 217. Many volumes have been written on the proper means of treating this form of ulcer. The distinguished surgeon from whose memoir we have so largely quoted, especially recommends opium, regulated pressure, and blistering. A grain of opium night and morning is usually sufficient. The pressure is applied with straps of adhesive or lead plaster on linen. The object of blistering is not only to stimulate the ulcer, but to soften its callous edges by causing absorption of part of the exudation with which they are infiltrated, and desquamation of the cuticle which covers them. The expediency of healing old ulcers of this kind has often been called in question, inasmuch as apoplexy, palsy, mania, and other serious diseases are said to have followed the healing of such ulcers. In the following cases it may be decided that a cure should not be attempted. (1) If the ulcer be affected by the gout, having regular attacks of pain, returning at stated periods, and similar to what the patient has experienced from gout in other parts. (2) If an ulcer habitually occur whenever the constitution is disordered. (3) If the patient be very infirm and old; for under these circumstances the removal of a habitual source of irritation, or the diversion of a habitual efflux of blood may prove fatal; and especially as very old ulcers have been known to heal spontaneously a short time before death. To these cases, specified by sir E. Home, Dr. Druitt adds (4) that of ulcers on the legs of stout women about the critical period of life, and displaying a tendency to discharge profusely as the menstrual discharge diminishes. To counteract these dangerous tendencies, the bowels should be freely purged during, and for some time after, the cure of an old ulcer; and if there any symptoms of congestion in the head, a seton should be inserted in the back of the neck.

For the treatment of *sloughing ulcers*, we must refer to the article **SYPHILIS**.

U'LEABORG, a län of n. Finland in Russia, bounded by Norway and Sweden, containing lake Enare ; 63,955 sq.m. ; pop. '87, 234,015; later estimate, 253,886.

U LEABORG, a sea-port t. of Russian Finland, capital of the government of the same name, stands on the s. bank of the Ulea, on the eastern shore and near the head of the gulf of Bothnia. It was founded in 1605, and the privileges of a port were granted to it in 1715. In 1823 it suffered severely from fire. The harbor has of late years become so shallow, that vessels are obliged to unload in the roadstead, 4 m. from the town. Pop. '94, 13,145 who are engaged in the dockyards, sawmills, and breweries of the town. In 1854, an English flotilla burnt the government property in the place.

ULEMA, the collective name of a certain class of theological jurists in Turkey, who, as is the case in Mohammedan countries, derive their decisions from the Koran and its commentaries. The ulema enjoys many privileges; he pays no taxes, cannot be condemned to death or deprived of his property by any court of law. He can only—eventually—be deposed and banished. The ulemas have to recognize, save their two immediate superiors (the *kadiaskers* or *kadilesks*), only the mufti as their chief authority, while they are the superiors of all the mollahs (q.v.) in the different provinces. The kadis form the lowest judicial class, and are subject to the mollahs in every respect.

ULEX. See **FURZE**.

ULFILAS (*Ulphilas, wulfilas* = little wolf), the celebrated translator of the Bible into Gothic, was born about 310 A.D., of Marcomannian parents, n. of the Danube, among a Gothic population. Consecrated bishop in 341, he was expelled in 348 by his heathen compatriots from his native place, and went, together with a number of newly-converted Christians, to lower Moesia, at the foot of the Hæmus, where he remained for thirty years. In 383 he went to Constantinople (whither he had gone once before to assist at a council, in 360), and died there shortly afterward. He was one of the chief lights of Arianism (see **ARIUS**), in the interest of which he exerted himself with the utmost energy. Nor was his political influence less felt among his Gothic countrymen; and the contemporaneous Greek historians, no less than those that followed within a short time after his death, are unanimous in attributing to him the largest share in the religious and social development of the Gothic population. His greatest work, however—one which will render his name famous for all ages—is his Gothic translation of the Bible, a work by which he contrived both to fix the Gothic language and to perpetuate Christianity among the Gothic people. Familiar with Latin, Greek, and Gothic, and accustomed to write in each of them, he undertook to render the whole Bible, with the exception of the two warlike books of Samuel and Kings—the influence of which he feared for his easily inflammable people—into a language which till then had, as far as we know, never been used for any literary composition of importance. Up to the 3th c., this sacred and national work accompanied the Goths in all their migrations.

But from that period forth, nothing was known of it beyond what was found stated in the ancient ecclesiastical accounts. It was not till the end of the 16th c. that Arnold Mercator discovered in the abbey of Werden the four Gospels of Ulfilas. Thence it found its way to Prague, where it remained till 1648, when the Swedes took it as a spoil to Upsal, where it still remains in the university library, under the name of the *Codex Argenteus*. In 1818, further remnants of the work—a great portion of the letters of St. Paul—were discovered by A. Mai and Castiglioni, on palimpsests, in a Lombardian monastery, which, added to a few minor fragments, bring the New Testament somewhat near completion. But hardly anything—save a few passages from Ezra and Nehemiah—has survived of the Old Testament. The immense importance of this sole Gothic remnant for Teutonic philology cannot well be overrated. It is principally through it that the wonderfully fine structure of Gothic—a Germanic dialect of surpassing wealth and purity—has become known.

ULLASUTAI, a city in the n.w. part of Chinese Mongolia, situated on the Uliasutai river, and capital of the district of the same name. The inhabitants are partly Chinese and partly Mongolians. The place is an important station for the Chinese-Russian trade.

ULLMANN, KARL, 1796–1865, b. Bavaria; studied theology at Heidelberg and Tübingen; was a friend of Hegel, Daub, and Schleiermacher; appointed professor at Heidelberg in 1821, simultaneously with Neander and Schleiermacher; in connection with Umbreit established in 1828 the Protestant quarterly review, *Theologische Studien und Kritiken*, for which he wrote able essays afterward separately published; professor at Halle, 1829–36; after which he returned to Heidelberg; bishop of state church in Baden, 1853, and president of its supreme ecclesiastical council, 1856–60. Among his published writings are, *Gregory Nazianzen; History or Myth? The Worship of Genius; Sinless Character of Jesus; Reformers Before the Reformation*.

ULLOA, ANTONIO DE, 1716–95, b. Spain; entered the Spanish navy in which he became lieutenant in 1735. The same year he accompanied to South America the French scientific expedition sent out to measure a degree of the meridian at the equator. In 1744 he was captured on his way to Europe, imprisoned in England, but released at the instance of his scientific friends. He came to Louisiana as its governor in 1766, but was forced to leave on account of an insurrection. Afterward put in command of a fleet which was to take a British merchant fleet near the Azores, and then to proceed to Havana, and join an expedition against Florida. He neglected to open his sealed orders and was tried by court martial in 1780, and acquitted. He did not, however, again enter the service.

ULLSWATER, after Windermere, the largest of the English "lakes," lies between the counties of Cumberland and Westmoreland, 10 m. e. of Keswick. Length, 7½ m.; breadth, ¼ to ½ m. Its scenery has none of the soft beauty of that of Windermere, but is rugged and grand. One of the chief features of the landscape is the lofty mountain Helvellyn, which rises from the s.w. extremity of the lake.

ULM, the second city of Würtemberg, in 49° 54' n. lat., and 8° 8' e. long., was, till the war in 1866, a stronghold of the Germanic confederation, garrisoned by troops of Würtemberg, Austria, and Bavaria. It was long one of the most important imperial free cities. Ulm is situated at the junction of the Blau with the Danube, which then becomes navigable, 53 m. w. of Augsburg by railway. Two bridges unite the city with New Ulm, a village on the Bavarian side of the river. The streets are narrow, and the buildings old. Pop. '95, 39,304. The environs of Ulm are flat. The cathedral, which is a Protestant church, is remarkable for architectural beauty, and is, next to the cathedral of Cologne, the largest church in Germany. It is 405 ft. in length, 159 ft. in breadth, the nave is 136 ft. high, the spire (finished 1890) over the main entrance, 528 ft. high. The building was begun in 1377, and finished in 1494. There are good schools for the people, a gymnasium, high school, and trades' school, a public library, an agricultural society, and many charitable institutions. Leading industries are weaving linen, cotton, woolen, and mixed fabrics; bleaching; making paper, leather, beer-brewing, ship-building, book-printing, etc. Ulm is famed for ornamental pipe-bowls, and pastry called Ulmer bread. Around the city, gardening is extensively carried on, and asparagus especially cultivated.

The Romans had a settlement at this important point. In 1531, the city accepted the reformation, and the majority of the people have since been Lutherans. In 1802, Ulm was attached to Bavaria, and became part of Würtemberg in 1810.

ULMACEÆ, a natural order of exogenous plants, regarded by some botanists as a sub-order of *urticaceæ*. They are trees or shrubs, having rough alternate leaves, each leaf with a pair of deciduous stipules. The flowers are small and in loose clusters. The perianth is small, membranous, bell-shaped, irregular; the stamens equal in number to the lobes of the perianth, and inserted into their base; the ovary superior. The fruit is 1–2 celled, nut-like, or compressed and winged. There are about 60 known species, natives of temperate parts of the northern hemisphere. See **ELM**; **NETTLE TREE**.

ULMIN. See **HUMUS**.

ULNA. See ARM.

ULODENDRON, a singular genus of coal-plants, founded on stems which occur chiefly in the roof-shales. The stems are covered with small rhomboidal scars, as in *lepidodendron*, formed by the bases of leaves or scales; but they differ remarkably from that genus in having a double series of large oval or circular markings, arranged linearly on the opposite sides of the trunk. These markings are variously interpreted as representing the cicatrices produced by the bases of cones, by branches, or by leaf-stalks. It is, like many of the coal fossils, an extremely enigmatical plant; and it is difficult to determine its position in the vegetable kingdom. It is probably an ally of *lepidodendron*, and that is known to be a vascular cryptogam nearly related to *lycopodium*. Seven species are known.

ULPIANUS, DOMITIVS, a celebrated Roman jurist, of Tyrian extraction, flourished in the early part of the 3d century. The exact date of his birth, however, is unknown. He appears to have held juridical offices during the reign of Septimius Severus and Caracalla, of which he was deprived by Elagabalus; but on the accession of Alexander Severus (222 A.D.), he became the principal adviser of the emperor, who appointed him *scriniorum magister* (keeper of the public records), a *consiliarius* (public assessor), and *prefectus annonæ* (superintendent of the corn-market). He also held during the reign of Alexander Severus the important post of prefect of the prætorian guards, though it is uncertain whether that monarch first conferred it upon him. He was murdered by his own soldiery, 228 A.D. Ulpianus was both a voluminous and a valuable writer. In the *Digest* of Justinian, there are no fewer than 2,462 excerpts from him, many of which are of considerable length. Altogether they form about a third of the whole body of the *Digest*. Unfortunately the originals have almost entirely perished. The principal were—*Ad Edictum* (83 books), *Ad Sabinum* (51 books), *Ad Leges Juliam et Papiam* (20 books). The so-called *Fragmenta* of Ulpianus (first published at Paris by Tilius in 1549) consists of 29 titles, whence they are called in the vatican MS. *Tituli ex Corpore Ulpiani*. The best edition is Husch's (Leip., 1881). There is an Eng. trans. by Abdy and Walker (1884).

ULRIC, ST., Bishop of Augsburg, and venerated as one of the fathers of the German church, was b. at Augsburg about the year 890. His father, Hupald, was one of those counts of Dillingen who play so important a part in mediæval German history, and Ulric himself owed part at least of the extraordinary influence which he exercised in his time to the distinguished rank of his family. He was educated in the celebrated Benedictine monastery of St. Gall (q. v.) in Switzerland, but his later life, and the character of his mind, as well as the tendency of his religious views, appear to have been influenced less by his monastic instructors, than by the counsels of a remarkable female recluse named Wiborada, whose cell was in the vicinity of St. Gall, and with whom he formed a close association. It was by her counsel that, instead of adopting the Benedictine habit at St. Gall, he devoted himself to the secular ministry, and returned to his native diocese of Augsburg, where he received holy orders. In accordance with the usage of his time, he made a pilgrimage to Rome, and soon after his return, was consecrated bishop of Augsburg, on the death of Hilte in the year 923. The details of his history as administrator of this church, which had suffered serious disorganization through the Magyar invasion and other wars, would be out of place here; but they are related with much circumstantiality by his contemporary biographer; and they throw so much light as well on the externals of the religious life of the time, as on the moral and spiritual character of the people, laity as well as clergy, as to merit the most serious consideration of every student of mediæval history. Bishop Ulric bore an important part in the public affairs of the empire during the reign of Henry I. and his son Otho; and he was the guiding spirit of the several councils in Germany which, in the 10th c., labored at the work of reformation. He died in 973.—See the ancient *Vita S. Oudalrici Episcopi*, which is edited by Mabillon, by the Bollandists, and recently by Dr. Pertz. Some letters and sermons, still extant, have been ascribed to Ulric, but they are regarded as spurious by Mabillon and Pertz, as well as by the Bollandists.—See Braun's *Geschichte der Bischöfe von Augsburg*.

ULRICI, HERMANN, a German philosopher, b. at Pforten in lower Lusatia, Mar. 23, 1806, studied at Halle and Berlin, and after a brief career as a lawyer, devoted himself exclusively to literature and philosophy. In 1834 he was appointed a professor-extraordinary at Halle, where he resided till his death. His first work was his *Geschichte der Hellenischen Dichtkunst* (1835), which was followed by a very ingenious essay on the dramatic art of Shakespeare (*Ueber Shakespeare's dramatische Kunst*. 1839; Eng. transl., 1846). Other works of Ulrici's are his *Ueber Princip und Methode der Hegel'schen Philosophie* (1841); *Das Grundprincip der Philosophie* (1845-46); a *System der Logik* (1852); *Gott und die Natur* (1863; 2d ed., 1866), *Gott und der Mensch* (1866), in which Ulrici develops a system of theistic philosophy, in opposition to materialism and anti-ethical pantheistic speculation. Further Shakespearian studies we have in *Romeo und Julia*, and a *Geschichte Shakespeare's und seiner Dichtung* (1862). He d. 1884.

UL'STER (Lat. *Utonia*), a province of Ireland, the most northern of the four provinces which compose that kingdom (see IRELAND), is divided into nine counties—Antrim, Armagh, Cavan, Donegal, Down, Fermanagh, Londonderry, Monaghan, and Tyrone, each of which is described under its proper head.

The territorial distribution under which Ulster formed a province, or at least a distinct territory, is of very ancient origin. It formed one of the five ancient divisions of Ireland, and was the seat of the Hy-Nialls or O'Neills, as well as of the lesser sept of O'Donnell, O'Cahan, O'Doherty, Maguire, MacMahon, etc. The north-eastern portion, now the county of Down, was early overrun by John de Courcy, and subsequently by Hugh de Lacy, and was the most permanent seat of English power in the north. The Antrim coast was occupied by a Celtic colony from Scotland and the Isles; but although various efforts were made by the English to effect a permanent settlement in the n. and n.w., the success was but nominal until the reigns of Elizabeth and of James I., when the plantation of Ulster was effected. Of this gigantic scheme of colonization, the chief seat was the county of Londonderry (q.v.). In Ulster, the Celtic race, owing to the frequent and large infusions of a foreign element, is found in a much smaller proportion. Pop. 1891, 1,619,814.

ULSTER, a co. in s.e. New York, having the Hudson river for its e. boundary; 1157 sq.m.; pop. '90, 87,062, chiefly of American birth, inclu. colored. It contains the Catskill mountains in the n.w., the Shawangunk mountains in the s., and lake Mohonk. Co. seat, Kingston.

ULSTER BADGE. On the institution of the order of baronets in England by James I., a sinister hand, erect, open, and couped at the wrist gules, the armorial ensign of the province of Ulster, was made their distinguishing badge, in respect of the order having been intended for the encouragement of plantations in the province of Ulster.

ULSTER KING-OF-ARMS, the king-of-arms or chief heraldic officer of Ireland. A king-of-arms called Ireland existed in the time of Richard II., but the office seems to have fallen into abeyance in the following century. Ulster was created to supply his place by letters-patent of Edward VI. in 1552. Ulster holds his appointment from the crown, and acts under the immediate direction of the lord-lieutenant of Ireland. His office is in the record tower of Dublin castle; and the professional staff under him consists of two heralds, four pursuivants, one registrar, and one clerk of records. The records of Ulster's office comprise pedigrees of the nobility and gentry of Ireland, certificates of their deaths and funerals, and grants of arms. The official arms of Ulster King-of-arms are: Argent, St. George's cross gules, on a chief of the last a lion passant gardant between a harp and a portcullis or.

ULSTER SETTLEMENT. A settlement in county Monaghan, in the province of Ulster, in the north of Ireland. The property was, in the year 1600, owned by Tyrone, one of the chieftains opposed to the armies of England, when finding the neighboring chiefs one by one submitting, and his own forces besieged at Kinsale, he also made his submission, and had his rank, power, and estates partially restored; but being afterwards suspected of attempting a new rebellion, he fled to Spain, leaving his property at the disposal of the king. In the spring of the year 1606, King James I., sent a colony composed of smiths, masons, carpenters, and other artisans, who composed the "settlement," and to whom the land was parceled out and possession given in the King's name.

ULTIMA THULE is a Latin phrase signifying "farthest Thule," and frequently used to express extremity, limit, or farthest range. See **THULE**.

ULTIMA'TUM, in diplomacy, the final conditions or terms offered by one government for the settlement of its disputes with another; the most favorable terms which a negotiator is prepared to offer, whose rejection will generally be considered to put an end to negotiation.

ULTRAMARINE, a beautiful blue pigment, formerly obtained only from the very valuable mineral, lapis-lazuli; but an artificial kind is now made so cheaply, and is so good, that it is generally used instead. The true ultramarine, from its costly nature, was only used by artists; the artificial sort is, however, extensively used by house and ship painters, and is as cheap as it is beautiful. Many artists still insist upon having the former kind, which is prepared as follows: Fine lapis-lazuli is broken up into very small pieces, so as to enable the operator to see and pick out the small white portions which occur in it. Of the pieces of pure blue which remain, a pound weight is then taken, and in a carefully covered crucible, is heated to redness, and then thrown into cold water. It is next reduced to an impalpable powder, and mixed with 6 oz. of finely powdered resin, as light in color as it can be obtained, and 2 oz. each of spirits of turpentine, bees-wax, and linseed oil, all previously melted together. When these ingredients are thoroughly worked into a mass, portions of it are taken and kneaded in clean water; as long as any blue color is given out, this is continued, until every portion has been so treated. The blue water is then allowed to rest, and the sediment is collected and washed in water several times. The first washing removes a considerable quantity of dirt and other foreign matters, and is consequently rejected. The second, after being well agitated, is decanted; and from it is obtained the highest quality of the pigment. That which remains usually has two other washings, each of which gives a product of a less value than the operation which preceded it. The product obtained by sediment from each of the waters used is carefully dried, and is then employed either to make cakes for water-color painting, or a mixture for oil-painting, the value being about £1

per ounce. **ARTIFICIAL ULTRAMARINE.**—The French chemists Clement and Desormes, in studying the curious process of obtaining ultramarine from lapis-lazuli by mixing it with resin, etc., were led to an analysis of the coloring matter that suggested to Guimet the idea of composing it artificially. In this he succeeded, and obtained for his discovery the prize of 6,000 francs offered by the *Société d'Encouragement des Arts*. Almost simultaneously, Gmelin in Tübingen gave an analysis and a synthetic process which also succeeded, and artificial ultramarine is now a regular article of manufacture. Chemical skill, however, is necessary to success, and the manufacturers' formulas are very various—differing in the quantities of the ingredients, and the order of mixing them. The German manufacturers are very successful, and some of them have recently produced a fine green ultramarine. The following formula is one of the simplest: 100 parts of finely-washed kaolin or porcelain clay (silicate of alumina), 100 of carbonate of soda, 60 of sulphur, and 12 of charcoal are mixed and exposed in a covered crucible to a bright heat for $3\frac{1}{2}$ hours, when a green, unfused residue should be left. This residue, after being well washed and dried, must be mixed with a fifth of its weight of sulphur, and exposed in a thin layer to a gentle heat, so as just to burn off the sulphur. When this is accomplished, more sulphur must be added, and the washing repeated; and so on, until the mass acquires a light blue color, which is usually the case after the third roasting. In 1872, however, Fürstenau introduced improvements into the manufacture of ultramarine, showing how the blue tint could be produced in one calcination. There is reason to believe, from the experiments of Wilkens, that ultramarine is composed of two portions—one of which is constant in its composition, and is the essential coloring matter, containing about 40 of silicic acid, 26 of alumina, 13 of sulphur, and 21 of soda, arranged as a mixture of two silicates of alumina, sulphite of soda, and sulphide of sodium—the blue coloring principle being a compound of the latter two; while the other portion differs from the former in resisting the action of hydrochloric acid, and contains a variable amount of sand, clay, oxide of iron, and sulphuric acid. Ultramarine, if heated in the air, gradually assumes a dull green tint; and it is quickly decomposed by the action of the mineral acids and chlorine.

The term *yellow ultramarine* is sometimes given commercially to chromate of baryta, a yellow insoluble powder used as a pigment.

ULTRAMONTANE (Lat. beyond the mountains—the Alps—viz., in relation to France), that party in the church of Rome which assigns the greatest weight to the papal prerogative. The pope, according to the Ultramontane doctrine, is superior to general councils, and independent of their decrees; he is considered to be the source of all jurisdiction in the church; and it is through him, and not directly in virtue of their episcopal office, that the bishops derive their powers of “jurisdiction,” as distinguished from those of “order.” See **ORDERS**. The Ultramontane school has been the opponent of those doctrines and views which favor the right of self-government by national churches. The school opposed to the Ultramontane is called the Gallican. See **GALLICAN CHURCH**.

ULTRA VIRES, a legal term meaning, literally, “beyond one's powers,” and employed since the law of corporations has become of great importance, to indicate acts or contracts entered into by corporate bodies, beyond the scope of the powers given them expressly or from implication in their charters. It is clear that the corporation can, itself, take no advantage from, or demand the enforcement of, such a contract; and, hence, the question commonly arising is, how far or in what cases will the corporation be allowed to set up its own lack of authority to enter into a contract as a valid defense against its enforcement by the other contracting party. The general rule is that the contract is void; but where the second party has performed his part of the agreement and the corporation has received benefit, as money or other valuable consideration, decisions differ widely. The extreme ground has been taken that the contract is not only void but illegal, as against public policy, and that no action growing out of it can be maintained. On the other hand, it has been held that the corporation is, on common law principles, *estopped* from setting up *ultra vires* as a defense, unless the contract be illegal in itself or expressly prohibited. But the most reasonable view is that which, while declaring that no action can be maintained on the contract itself, as it is void, allows the second party to recover by the appropriate legal action the money or consideration paid, after the contract has been rescinded. Where a corporation has acted *ultra vires* proceedings may be taken by the state by *quo warranto*, and it is no defense that the officers or agents of the company acted without the express authority of the corporation. The charter may be revoked as a penalty for acts *ultra vires*.

ULUGH-BEG, the grandson of Timûr (q.v.), governed w. Turkistan as regent for his father shah Rokh, while the latter was employed in regulating the affairs of the southern half of the empire, and succeeded, in 1447, to the imperial throne on his father's death. He was a successful warrior, as was of necessity every ruler of this period; but happening, unfortunately, to conceive suspicions of the loyalty of his eldest son, suspicions founded only upon astrological indications, the offended and injured prince rebelled, defeated and captured his father, and soon after caused him to be put to death, thus fulfilling the prediction, 1449 A.D.

Ulugh-Beg is known to posterity as the founder of the observatory at Samarcand, as the liberal patron of astronomers, and as himself a most diligent observer. The astro-

nomical tables which bear his name, in all probability compiled by himself and his two fellow-laborers, Salah-ed-din Cadizadeh al Roumi and Gaiathed-din Mohammed Jerusheid al Coushi, enjoy a high reputation for accuracy, considering the time when they were compiled, and the means of observation in the hands of astronomers. The astronomical works of Ulugh-Beg were written in Arabic, afterward translated into Persian, and thence the chronological portion of them rendered into Latin (Lond., 1650), by Greaves, who followed with a Latin version of the geographical part in 1652. An independent version of the same work in Latin and Persian was published by Dr. Thomas Hyde, at Oxford, in 1665. A new edition of Ulugh-Beg's catalogue of stars will be found in the *Memoirs of the Royal Astronomical Society*, vol. xiii.

ULULATION (Lat. howling). It sometimes happens that articulate sounds or cries resembling, perhaps imitative of those of animals, or mere shrieking and howling, form the sole or chief symptom and characteristic of a morbid mental state. The act is automatic, and may be regarded as indicative of grave changes in the physical and moral nature. In the Middle Ages, during great religious excitement, and those mental epidemics which involved large communities, such phenomena appear to have been of frequent occurrence. It appears that in the 18th c., a family of five sisters, in the county of Oxford, were affected with a modification of hysteria, during which they howled or barked like a dog; and that about the same period, a large religious community of females in France, one and all, and at the same hours, shrieked or mewed like cats; and were only reduced to sobriety and to silence by the presence of military.—Laycock on *Nervous Diseases of Females*, p. 286; Calmeil, *De la Folie considérée sous le point de Vue Pathologique, Philosophique, Historique, et Judiciaire*, t. ii. p. 310.

ULVÄ. See LAYER.

ULVERSTON, a small but important market-t. and sea-port of Lancashire, in the district of Furness, 25 m. by railway n.w. of Lancaster. It stands in an extensive agricultural and mining district, and is the center of commerce for Furness, and for parts of Cumberland and Westmoreland. It contains cotton and paper mills, and carries on manufactures of linen, ropes, and woolen yarn, and has a coasting-trade in iron and copper ores, limestones, grain, and gunpowder. Pop. '81, 10,001; '91, 9948.

ULYSSES, ULYXES, AND ULIXES, the Latin forms of the Greek ODYSSEUS, i.e., the "Angry," the name of one of the most celebrated heroes of the Trojan war. Different accounts are given of his parentage; but according to the oldest legend, the Homeric, he was the son of Laertes, prince of Ithaca (one of the Ionian isles), and of Anticleia, daughter of Autolycus. According to a later account, his father was the crafty Sisyphus; whence he is sometimes called, by way of reproach, Sisyphides. He married Penelope (q.v.), by whom he became the father of Telemachus. While still a youth, he had acquired a reputation for courage, eloquence, and address. When the expedition against Troy was resolved on, Agamemnon visited Ithaca, and prevailed on Ulysses, though with difficulty, to take part in it. Later traditions, or, as in this case, perhaps we ought to call them *inventions*, go on to exaggerate the reluctance of Ulysses to leave his home, and represent him as feigning madness—an artifice which did not, however, succeed. Before hostilities broke out, Ulysses, in conjunction with Menelaus and Palamedes, was sent to Troy, with the view of persuading the Trojans to give up Helen and her treasures; but this little bit of diplomacy having failed, the Greek princes assembled their fleets in the port of Aulis, and sailed for Troy, Ulysses bringing with him twelve ships. During the siege, Ulysses performed important services for the Greeks. In prudence, ingenuity of resource, and *finesse*, he was the foremost of the Hellenic chiefs, while in courage he was inferior to none. After the fall of Troy, the most interesting part of Ulysses's career begins, and forms the subject of the Homeric poem called the *Odyssey*. Several of his adventures are manifestly of eastern origin, and closely resemble those of *Sinbad the Sailor*. Setting sail for home, his ships were driven by a storm on the coast of Thrace; where he plundered the town of Ismarus, but lost a number of his crew. Having re-embarked, a north wind blew them across the Ægean and the Levant, to the country of the Lotophagi (the "Lotus-eaters"), on the coasts of Libya, where the companions of Ulysses ate of the wondrous fruit, and wished to rest forever. (Our readers will remember Tennyson's delicious rendering of this episode.) But their leader compelled them to leave the land "in which it alway seemeth afternoon;" and sailing n. again, they touched at the "island of goats," where Ulysses left all his ships but one. Thence he proceeded westward, till he reached the "island of the Cyclopes" (Sicily), where occurred the incident narrated under POLYPHEMUS (q.v.). The island of Æolus, and the city of the Læstrygones (a race of cannibals), whither fortune and the winds next carried the Hellenic chief, are supposed to be only names for particular parts of Sicily. Thence he sailed westward to the island of Ææa, inhabited by the sorceress Circe (q.v.). After a year's sojourn, he departed, and sailing still further w., crossed Oceanus, the "ocean-stream," into the country of the Cimmerians (q.v.), where darkness reigns perpetually. Here (following the advice of Circe) he descended into Hades (q.v.), and inquired at the blind seer Teiresias how he might get back to his native land. Teiresias disclosed to Ulysses the fact of the implacable enmity of Poseidon (Neptune), on account of his having rendered Polyphemus (who was a son of Poseidon by the nymph

Thoosa) blind, but encouraged him at the same time with the assurance that he would yet reach Ithaca in safety, if he would not meddle with the herds of Helios (the sun-god) in Thrinacia. Ulysses now retraced his course, and once more visited Circe, the kindly sorceress, who forewarned him of the dangers he would yet have to encounter, and how to act. A w. wind blew them past the perilous island of the Sirens (q.v.) to the coasts of Italy. In passing between Scylla and Charybdis, the monster that inhabited the first of these rocks devoured six of Ulysses' companions. He next came to Thrinacia, which he would fain have passed by, but his crew insisted on landing, and in spite of their oath, killed some of the cattle of Helios while Ulysses was asleep. The anger of Zeus was kindled. When they had sailed away, a fierce storm arose, and Zeus sent forth a flash of lightning that destroyed the ship. Every one on board was drowned except Ulysses himself, who, after many dangers, reached the island of Ogygia, the abode of the nymph Calypso, with whom he lived for eight years. After his departure (which was commanded by Zeus, who had promised to Athene that Ulysses should one day see Ithaca again—the poet always represents him as having a longing after his native isle), Poseidon persecuted him with a storm, and cast him on the shores of Scheria, the island of the Phæacians, in a very forlorn and indescribable condition. He was, however, very kindly received by Nausicaa, daughter of king Alcinous; and having revealed his name at a feast, the monarch provided him with a ship to carry him home. Ulysses was asleep when the vessel approached the coast of Ithaca; and the Phæacian sailors who had accompanied him bore the unconscious hero to the shore, and left him there. When he awoke, he did not at first recognize where he was; but Athene appearing, informed him, and of all that had happened to Penelope (q.v.) in his absence. Disguised as a beggar, he repaired to his own court, where he was recognized by his nurse, and, as Homer touchingly describes, by his old dog, Argus. Aided by Telemachus, and the swine-herd Eumæus, he took vengeance upon the insolent suitors of his wife, all of whom, without exception, he slew. Homer records nothing more of Ulysses's history; but he makes Teiresias prophesy, in the 11th book, that the hero would meet a painless death in a happy old age. Another tradition says that he was slain by Telegonus, his son by Circe. Later poets, e.g., Virgil and Ovid, represent Ulysses as a much less noble and valiant character than he appears in Homer; his wisdom and subtlety are changed into cunning and deceit; and instead of heroic courage, he displays the spirit of a coward.

UM is a Kaffir or Zulu word signifying river, and is used as prefix in the names of most of the rivers on the s.e. coast of Africa, from the Great Kei, where the names of Hottentot origin appear to cease, as far to the n.e. nearly as the Sofala coast, where the names Imhambane, Imhampoor, have the same prefix in a corrupted shape. Among the principal rivers on this coast bearing this prefix may be mentioned the Umgazi, Umbashee, Umtata, Umzimvoobo, and Umzimcula, draining Independent Kaffraria; the Umcomanzi and Umtugela, in the colony of Natal; and the Umfolusi, Umhlatozi, and Umapoora, between Natal and Delagoa bay. The Hottentot word Kei has the same meaning, and is still preserved in the Kei and Keiskamma rivers, the Keiriega, Keisuga, and other streams on the e. coast of Cape Colony.

UMĀ is, in the epic and Purāṇic mythology of India (see *religion*, under **INDIA**), one of the principal names of the consort of the god Śiva. Other names by which she is also usually designated are *Durgā*, *Devī*, *Kālī*, *Pārvatī*, *Bhavanī*, while there are many more belonging to her which are of less frequent occurrence, as *Kātyāyanī*, *Ambikā*, *Haimavatī*, *S'ivā*, etc. As Śiva is not yet a deity of the vedic period of India, such of these names as are met with in Vedic writings have there a different import from that assigned to them by the later mythology. Thus, *Ambikā* is, in the Yajurveda, a sister of *Rudra* (q.v.); *Kālī*, a word which occurs in the Mun'dāka Upanishad (q.v.), is there the name of one of the seven flickering tongues of Agni, the god of fire; *Durgā* in a hymn of the Taittiriya Aran'yaka, is an epithet of the sacrificial flame; and *Umā*, when mentioned in one recension of the same Aran'yaka (see **VEDA** and **UPANISHAD**), and in the Kena Upanishad, means the Brahma-science, or the knowledge of what is the nature of Brahman, the supreme soul; and in this sense she is identified in the Taittiriya Aran'yaka with *Ambikā*. But since Rudra is in later mythology a name of *Śiva*, and the Vedic Rudra is a form of Agni, the fire, more especially of the fire of the sun; and since Umā, in the Kena Upanishad probably designates the power of Śūrya, the sun, it becomes intelligible that Śiva (q.v.), who, at a later period of Hindu religion, is both the type of destruction and contemplation, had then associated with him deities which originally represented the energy of the fire and the power or wisdom of the sun, and that those deities were afterward held to be merely different forms or names of one and the same deity, viz., his female energy (see **ŚĀKTAS**), or wife. Though this double character of the consort of Śiva is not always discernible in the myths which are connected with special designations of hers, and though at a late period the popular creed looked upon her far more as the type of destruction than as that of divine wisdom, yet the works devoted to her praise never fail to extol her also as the personification of the highest knowledge. Thus, in the *Devīmāhātmya*, the Rishi Mārkan'd'eya, in reply to a question of king Suratha, says: "By Devī, this whole universe, with what is movable and immovable, has been created, and, when propitious, she who bestows blessings leads men to their eternal bliss; for she, the eter-

nal goddess, is the highest wisdom, the cause of eternal bliss, and also the cause of bondage for this world; she, who lords over the Lord of the universe." And in another passage of the same work, she is invoked thus: "O Devī, thou art the seed of the universe, the highest Māyā (q.v.); all this world is bewildered, but, descending on earth, thou art the cause of its final liberation: all the sciences are merely different modes of thyself." Similarly, also, in the *Mahābhārata* (q.v.), Arjuna says to her: "Of sciences thou art the Brahma-science," etc.; and in the *Harivans'a*, Vishn'u addresses her as Saraswati, the goddess of eloquence, as Smṛiti, tradition, and, of sciences, as the Brahma-science, etc.

The myths relating to this goddess, who is worshiped in various parts of India—particularly, however in Bengal (see S'ĀKTAS)—are met with in the great epic poems and Purān'as, in poetical works, such as the *Kumārasambhava* (see KĀLIDĀSA), and in modern popular compositions; but the text-book of her worshipers is the *Devīmāhātmya*, or, "the majesty of Devī"—a celebrated portion of the *Mārkan'd'eya Purān'a*, and considered to be of especial holiness by the worshipers of this goddess. In the *Rāmāyan'a* (q.v.), she is spoken of as the daughter of mount Himālaya (her names *Pār-vatī*, *Haimavatī*, *Ādrījā*, *Gīrījā*, and similar ones, mean "the mountainous or the mountain-born"), and of the nymph Menā, whose elder daughter, however, was the Ganges. According to the Vishn'u and other Purān'as, she was in a former life *Satī*, the daughter of Daksha, who abandoned her corporeal existence in consequence of having been slighted by her father when he performed a great sacrifice, and did not invite Śiva to share in it; but it was only as Umā that she bore children to her husband, viz., *Ganes'a*, the god of wisdom, and *Kārttikeya* (q.v.), the god of war. According to the *Harivans'a*, she was, in another life, born as the daughter of Yaś'odā, and exchanged for *Vishn'u*, when in his incarnation as *Kr'ishn'a*, he was born as a son of Devaki. See *VISHN'U*. On that occasion, she was killed by *Kansa* (q.v.); but as soon as he had dashed her to the ground, she rose to the sky, leaving behind her corporeal frame, and became a divine virgin, to whom the gods addressed their praises. Hence her names, *Kanyā*, *Kumārī*, etc., the virgin. This connection between the legendary history of Umā and Vishn'u is also briefly referred to in the *Devīmāhātmya*, though this work is chiefly concerned in the narrative of the martial feats of the goddess. The latter consisted in the destruction by her of two demons, *Madhu* and *Kait'abha*, who had endangered the existence of the god Brahma; and of the demon *Mahisha*, or *Mahishāsura*, who, having conquered all the gods, had expelled them from heaven, and who met Devī, assisted only by her lion, with a numberless host of demons; moreover, in her defeating the army of *Chan'd'a* and *Mun'd'a*, two demon-servants of *S'umbha* and *Nis'umbha*; in her killing the demon *Raktavīja*, who had a sort of charmed life, each drop of his blood, when shed, producing hundreds of demons like himself; and ultimately, in her destroying the demons *S'umbha* and *Nis'umbha* themselves. In commemoration of her victory over *Mahishāsura*, a festival called the *Durgāpūjā*, or *Durgotsava*, is annually celebrated in Bengal. "The goddess," the Rev. Mr. Banerjea relates in his introduction to the *Mārkan'd'eya Purān'a*, "is there represented with ten arms, trampling upon the demon, who is also attacked by her lion, and wounded in the chest by her spear. She has also laid hold of him by the hair, and is about to chop off his head. The most popular commemoration of this event takes place in the autumn, about the time of the equinox; and if the practice may be supposed to be 800 or 1000 years old, it is not inconceivable that it was originally fixed at the equinox, though the precession has since made it a few days later. The calculation of the day depends, however, on a certain lunar day; but it can never be earlier than the seventh of Ās'vin, which is about the time of our present equinox; nor can it be more than a month later than that date. The idea of the possible connection of the *Durgāpūjā* with the equinox, is suggested by the fact, that there is a corresponding festival about the time of the vernal equinox too, in which, though it is not so popular as the autumnal *pūjā*, the same group of figures is constructed, and the image of the goddess is in the same attitude, with the same attendance, and the same enemy." (For a somewhat more detailed account of this festival, see Moor's *Hindu Pantheon*, p. 156.) Three weeks after the *Durgāpūjā*, another festival in honor of this goddess, called the *Kālīpūjā*, takes place, to commemorate her victory over *Chan'd'a* and *Mun'd'a*. "The sable goddess," Mr. Banerjea says, "is represented holding the severed head of *Chan'd'a* in her hand, with the heads of his soldiers formed into a garland suspended from her neck, and their hands wreathed into a covering round her loins—the only covering she has in the image constructed for the *pūjā*. The worship of *Kālī* (i.e., the black), to which the narrative (of her victory over *Chan'd'a* and *Mun'd'a*) has given rise, is considered by the Hindus themselves as embodying the principle of *tamas*, or darkness. She is represented as delighting in the slaughter of her foes, though capable of kindlier feelings to her friends. She is, however styled the black goddess of terror, frequenting cemeteries, and presiding over terrible sprites, fond of bloody sacrifices; and her worship taking place in the darkest night of the month." (For this worship, see also the article *TRUTH*.) With Ś'iva, she resides on mount *Kailāsa*, the northern peak of the Himālaya, or in her own palace on the Vindhya mountain, where she amuses herself with hunting. Her representations are numerous and various. Sometimes she is seen riding on a bull, with a trident in her hand, a serpent as bracelet, and a half moon on her forehead; sometimes, when in

the act of fighting Mahishâsura, she rides on her lion (*Manastâla*), the latter standing between the frontal bones of her elephant. Or, as *Bhadra-Kâli*, she is represented "eight-handed, two of her hands being empty, pointing upward and downward, one of her right hands holding something like a caduceus, its corresponding left hand a cup; the next right and left hands a crooked sword, and a shield with an embossed flower or fruit; the superior right hand, an agricultural implement; and the left, the noose to strangle victims with [see *THUG.*] Her person is richly dressed and ornamented; between her full breasts, a five-headed serpent unpears itself; she has a necklace of human heads; her ear-drops are elephants; and a row of snake-heads peeps over her coronet. Her forehead is marked either with S'iva's third eye, or her own symbol; and her open mouth shows her teeth and tusks, giving her a fierce and threatening aspect." See Moor's *Hindu Pantheon*, where, besides, other descriptions of images of this goddess are given.—For the myths relating to her, see John Muir's excellent work, the *Original Sanskrit Texts*, vol. iv. (Lond. 1863); the *Harivans'a*, translated by A. Langlois (Paris, 1834-35); and the *Mârkand'eya Purân'a*, in the *Bibliotheca Indica*, edited, with an elaborate preface, by the Rev. K. M. Banerjea (Calcutta, 1862).

UMAN', a t. of Russia, in the government of Kiev, 120 m. s. of the town of Kiev, on the Umanka. It is inclosed by earthen ramparts. Pop. '85, 15,976.

UMATILLA, a co. in n.e. Oregon, having the Columbia river on the n.w., a range of the Blue mountains in the s.e.; 2885 sq. m.; pop. '90, 13,381, chiefly of American birth. Co. seat, Pendleton.

UMBAGOG LAKE, in Oxford co., Maine, and in the t. of Errol, Coos co., N. H.; 15 m. long, from 1 to 10 m. wide, discharging into the Androscoggin. It is famous for its fine trout, and is 1256 ft. above sea-level.

UMBALLA, or **AMBA'LA**, a walled t. of India, capital of the division of the same name in the Punjab, lies in a wide plain, on the Simla railway, 129 m. n.n.w. of Delhi. There is considerable export of grain, cotton-goods, and carpets. Pop. '91, 72,270.

UMBELLIFERÆ, *Apiaceæ* of Lindley, a large and important natural order of exogenous plants, containing more than 1000 species, abounding chiefly in the temperate regions of the northern hemisphere. A peculiar regularity distinguishes the inflorescence of most of this order; a number of stalks, radiating from a common center at the top of the stem, or of a branch, each of which bears a flower at its extremity, thus forming what is called an *umbel*. The umbel is often compound, the primary stalks dividing in a radiated manner, and forming *secondary umbels* or *umbellules*. The flowers are generally small, although the umbel which they compose is often large. They are generally white, rarely yellow, still more rarely red, though frequently tinged with pink at the edges; have a 5-toothed calyx, often obsolete, or nearly so; a corolla of five petals, inserted in the top of the calyx, and alternating with its teeth, five stamens, an inferior germen, and two styles. The fruit is very peculiar, and consists of two one-seeded, unopening carpels, rarely fleshy, touching one another on the inner side, and there attached to a little column (the *carpopore*), their common axis. Each carpel has five primary and four secondary longitudinal ridges, more or less distinct; and beneath the separating furrows there are often linear receptacles of essential oil, called *vittæ*. The umbelliferæ are mostly herbaceous plants, rarely shrubby. They generally have divided or compound, rarely simple leaves. They generally abound in a resinous secretion, and a volatile oil, from which many of them derive poisonous and medicinal properties, which are more or less common to all parts of the plant, and often highly developed in the seeds. Acridity is their general characteristic. Some are pleasantly aromatic, others have a powerful and disagreeable smell. In the roots of some, especially when enlarged by cultivation, starch and sugar are secreted, so that they become useful for food, although the peculiar flavor of the essential oil is still retained. The systematic arrangement of the umbelliferæ has been found difficult by botanists. Sprengel, De Candolle, Koch, and others, have devoted much attention to this order. Of esculent-rooted umbelliferæ, the carrot and parsnip are the best known examples. Skirret, earth-nut, and arracacha are also of some value. The roots of *anesorhiza capensis* and *feniculum capense* are used as esculents at the cape of Good Hope. The roots of *cherophyllum tuberosum*, or **SHAM**, are used in the Himalaya. The herbage of *prangos pabularia* is so bland that it is much used in the temperate parts of the East Indies for feeding cattle, and made into hay for winter fodder. It is said, however, to be injurious to horses, although oxen and sheep are rapidly fattened by it. The blanched stems of celery, enlarged by cultivation, are a favorite salad, and those of alexanders (*Smyrniolum olusatrum*) were formerly used in the same way. The candied stalks of eryngo were once much esteemed, and those of angelica are still used. The leaves of parsley, chervil, fennel, etc., are used for flavoring. Lovage (*levisticum officinale*) is sometimes cultivated as a salad plant. The seeds of anise, caraway, coriander, etc., are used as carminatives. Hemlock, water hemlock, water parsnip, fool's parsley, and many others, are narcotic poisons—asafetida, galbanum, sagapenum, and opoponax are medicinal products of this order.

UMBER, *Scopus umbretta*, an African bird of the family *ardeideæ*, allied to the storks, but having a compressed bill with sharp ridge, the tip of the upper mandible hooked,

and the nostrils situated in a furrow which extends all the length of the bill. It is about the size of a crow, with umber-colored plumage, and the male has a large crest on the back of the head.

UMBER, a mineral used as a pigment, a variety of the iron ore called hematite (q.v.), and consisting chiefly of oxide of iron, with some oxide of manganese, silica, alumina, and water. It is soft and earthy, of a dark brown color, and has a conchoidal fracture. It readily imbibes water, and falls to pieces, like newly-burnt lime. It is found in Cyprus in beds. When roasted, becomes reddish brown in color, and in that state is also used as an artist's color.

UMBILICAL CORD, in botany, the connecting link between the placenta of the ovary and the ovule through which pass the vessels which nourish the ovule till it ripens into the seed. In some plants, the ovules are so closely connected with the placenta, that no umbilical cord can be said to exist; in others it is of considerable length.

UMBILICAL CORD, or **NAVEL STRING**, the bond of communication between the fetus (which it enters at the umbilicus, or navel) and the placenta, which is attached to the inner surface of the maternal womb. It consists of the umbilical vein lying in the center, and the two umbilical arteries winding from left to right round the vein. Contrary to the usual course, the vein conveys arterial blood to the fetus, and the arteries return venous blood to the placenta. These vessels are imbedded in a yellow gelatinous matter, known from its first describer (in 1659) as Wharton's gelatine. Nervous filaments have been traced into the cord; but the presence of lymphatics is doubtful. The whole is invested by a membrane (the amnion), and its ordinary length is about 20 inches. As soon as a child is born, and its respiration fairly established, the umbilical cord is tied, and divided near the navel, which spontaneously closes, the fragment of attached cord dying away. See the articles **FÆTUS** and **PLACENTA**.

UMBILICAL HERNIA is the term applied to the protrusion of intestine at the navel or umbilicus. It is, for obvious anatomical reasons, of most frequent occurrence shortly after birth; but it is not uncommon in women who have been frequently pregnant. If the hernia is reducible, and the patient an infant, the ordinary course of treatment is, after returning the parts to their proper position, to place the convex surface of an ivory hemisphere on the navel, and to retain it there either with strips of adhesive plaster, or with a bandage. Special trusses are made for the treatment of this affection in adults. In cases of irreducible hernia, a large hollow pad should be worn. If it becomes strangulated, an operation may become necessary.

UMBILICUS is the anatomical term for the navel.

UMBREIT, **FRIEDRICH WILHELM KARL**, 1795-1860; b. Germany; received a theological education at Göttingen. In 1820 he was called to the chair of theology and philosophy at Heidelberg, where he remained till his death. His most important work is *Commentar über die Propheten des Alten Testaments*, 4 vols. (1841-46). In conjunction with Ullmann he established *Theologische Studien und Kritiken* (1828).

UMBRELLA (Lat. *umbra*, a shade). As a shade from the sun, the umbrella is of great antiquity. In the sculptures of Egypt, Nineveh, and Persepolis, umbrellas are frequently figured, closely resembling the chaise umbrella of the present day. In the east, however, its use seems to have been confined to royalty; but in Greece and Rome it was more extensive. The custom was probably continued in Italy from ancient times, but at the beginning of the 17th c. the invention seems to have been little if at all known in England. In that century, however, it came into use as a luxurious sun-shade; and in the reign of Queen Anne it had become common in London as a screen from the rain; but only for the weaker sex. The first person of the male sex who had the moral courage to carry an umbrella in the streets of London was Jonas Hanway, the founder of the Magdalene Hospital, who was newly returned from Persia, and in delicate health. Still, it was long regarded as a sign of infirmity or effeminacy to use them, and those who did so suffered much unpleasant jeering in consequence. They were at first all brought from abroad, chiefly from India, Spain, and France; now the manufacture of umbrellas has reached an enormous extent in the United States.

UMBRELLA BIRD, the *cephalopterus ornatus* of South America, the *coracina cephaloptera* of Vieillot. The coracina form a genus of birds separated from the crows (corvidæ) by Vieillot, and divided by him into four sections. The first comprises those species having velvety feathers at the base of the bill; the second, those whose nostrils are covered with hairy feathers directed forward, and with the upper mandible notched toward the end; the third having a bill naked at its base and notched at the point; and the fourth, that remarkable species on which Geoffroy Saint-Hilaire founded the genus *cephalopterus*. The *cephalopterus ornatus* of South America is of a uniform blue-black color. The head and base of the bill is ornamented with a crest forming a covering somewhat like a parasol, composed of straight elevated feathers with white and stiff shafts terminated by black beards which project forward forming altogether an umbrella.

like plume. The sides of the neck are naked, but long black glossy, metallic feathers forming a loose pelerine hanging below the breast spring from the throat and sides of the neck. The tail is long and slightly rounded. It is of the size of the common crow, and is the only species known.

UMBRELLA-SHELL, a genus of branchiferous gasteropod mollusks of the family *pleurobranchidae*, containing three known living, and two extinct, species. The small shell only covers the more important organs, and the shell is often covered by a mantle. See INVERTEBRATE ANIMALS.

UMBRELLA-TREE, a species of magnolia growing along the Alleghany mountains from Pennsylvania to Kentucky. It gets its name from the crowding of leaves on the summits of the flowing branches. See MAGNOLIA.

UMBRIA, one of the ancient divisions of Italy, w. of Etruria, and n. of the country of the Sabines. It is usually described as extending from the Tiber eastward to the Adriatic; but while this was probably the case in pre-historic times, it was not so during any part of the period of which we have authentic knowledge. Tradition, indeed, leads us to believe that at one time the Umbrian territory extended from sea to sea, embracing much, if not the whole, of the country subsequently occupied by the Etruscans; but when the Umbrians first come before us as a distinct people, we find them restricted to the ridges of the Apennines, the low-land region bordering on the Adriatic from the *Æsis* (mod. *Esino*) to the Rubicon, being held by a race of Gallic invaders, known as the Senones. The most notable towns of Umbria were Narnia, Interamna, Acriculum, Spoletium, Mevania, Fulginium, Assisium, Tifernum, Nuceria, Camerinum, Sentinum, Urbinum, Sena Gallica, Fanum, Fortunæ, and Ariminum.

The Umbrians were considered in ancient times to be the oldest people of Italy, and were in consequence, vaguely spoken of as "aborigines;" but neither the knowledge of the ancients, nor the methods of investigation which they pursued, allowed them to arrive at any trustworthy ethnological results. Modern researches into their language (of which we possess one important memorial in the tables of Iguvium; see EUGUBINE TABLES) have demonstrated that they spoke a tongue closely allied to the Oscan (see OSCI), and were therefore, in all probability, members of the Latino-Italian race. These researches further tend to confirm the tradition of their antiquity, for an analysis of the structure of the Umbrian language proves it to be the oldest of the Italian dialects.

The Umbrians make their first authentic appearance in the wars between the Romans and the Etruscans. They would seem to have been destitute of any political organization or unity, for we find that some of their tribes took part with the Romans, and others—probably the majority—with the Etruscans. At any rate, they were subjugated along with the latter people; and we do not read of them again until the third Samnite war, when in conjunction with the Etruscans and Gauls, they joined the Samnites in their last gallant struggle against the imperious supremacy of Rome (q.v.). The confederacy was utterly vanquished in the great battle of Sentinum (295 B.C.), and the Umbrians were again reduced to submission. The establishment of Roman colonies in the *Gallicus Ager*, or territory of the Senonian Gauls, seems to have completely overawed, and gradually even to have Romanized them. They stood faithfully by Rome in the dark years of the Hannibalic war, and were among the first to furnish Scipio with volunteers for the invasion of Africa. In 90 B.C., they obtained the Roman franchise, and thenceforth disappear from history as a distinct people.

UMPIRE is a third arbitrator appointed by two arbitrators in the event of their differing in opinion; and when the reference or arbitration has devolved upon the umpire, his award or umpirage becomes final and binding on the parties.

UMPQUA RIVER, a river rising in the Cascade mountains, Oregon, flowing in a general n.w. course, passing through the Coast range and emptying into the Pacific at Umpqua head about 22 m. n. of Empire City. The length of the river and its greater fork is about 200 m., and the valley through which it flows is very fertile. It is navigable by small steamers for about 100 m. above its mouth.

UMRO'HAH, a t. of British India, in the district of Moradabad, n.w. provinces, 80 m. e.n.e. of Delhi. Pop. 35,000.

UNAKA MOUNTAINS, the western and southern part of the Appalachians, along and near the boundary between North Carolina and Tennessee; length between the two states, about 200 m. in a s.w. course. North of the Watanga river the Unakas have three ridges divided by wide and beautiful valleys. In Virginia these ridges unite and are blended with the Alleghanies. The name signifies *white* in the Cherokee language. Where these mountains reach their greatest height in s.w. North Carolina, snow lies on their tops a large portion of the year. The Roan, about midway between Virginia and the French Broad river, is 6,306 ft. high; a bald mountain whose top is about 6 m. in length with three or four rocky knobs, and many acres level or gently sloping, covered with grass and flowers. Several species of plants are the same as on mount Washington, N. H. This is in many respects the most grand and beautiful of all the mountains e. of the Mississippi river. From it can be seen points in Virginia, Kentucky, Georgia, and Tennessee. Accommodations have been provided on it for the comfort of visitors in

summer. The great smoky range between the French Broad and Tennessee rivers has the highest of the Unakas; about twenty of their summits being higher than mount Washington. Among these the highest is Buckley's peak, 6599 ft., second only to mount Mitchell which is the highest of the Carolina mountains, and the highest e. of the Mississippi. This portion of the Unakas abounds in grand and rugged scenery, and many of the summits are difficult of access. The rocks are granite, gneiss, shales, sandstones, and rarely limestones of the archæan, Laurentian, lower, and upper Silurian periods. The climate is like that in southern Canada. The valleys of the Unakas have very many places suitable for summer resort; the streams abounding in trout, and the mountains with bear, deer, and smaller animals, while gnats and mosquitoes are rare.

UNALASH'KA, an island in the n. Pacific, belongs to the Fox group of the Aleutian islands, in lat. 55° 52' n., and 166° 32' west. It is 75 m. long, and in some parts 25 m. broad, has a rugged mountainous surface, and is thinly peopled.

UNCAS, d. 1683; sachem of the Mohegan Indians in Connecticut. He was a Pequot chief till 1635, when he revolted, and collected a number of Indians, who took the name of Mohegans which had once belonged to the Pequots, against whom he now fought as an ally of the English (1637). He was rewarded with a grant of Pequot lands. Several attempts to murder him were made by the Indians. In 1643 he defeated and put to death Miantonomoh. In 1648 the Mohawks and Pocotocks began an unsuccessful war against him. In 1657 he was besieged by the Narragansett sachem Pessacus, but was relieved by Ensign Leffingwell to whom he granted the present site of Norwich.

UNCIAL LETTERS—so called as being an inch (Lat. *uncia*) long—characters of a large and round form, used in some ancient MSS. The earliest form of an alphabet is its capitals, and the oldest Greek and Latin MSS. are written entirely in capitals. Uncial letters, which began to take the place of capitals in the middle of the 5th c., differ from them in being composed of rounded, and not straight lines, and exhibiting a tendency toward greater expedition in style. Uncial writing arose as writing on papyrus or velum became common, the necessity for more rapid execution leading to the practice of curving the lines. Its being more easily learned than the cursive style, was probably the cause of its becoming the favorite mode of writing books of importance among the monkish scribes; while legal instruments, which required greater dispatch, were executed by professional scribes in a corruptive form of the Roman cursive hand. Uncial writing prevailed from the 6th to the 8th, or even 10th century.

During the 6th and 7th centuries, a transitional style of writing prevailed in Italy, and to some extent elsewhere, in which the letters approximated more nearly to the Roman cursive hand; this passed by a gradual transition into the *minuscule* manner, or small hand, which from the beginning of the 10th c., became usual in MSS.—See Silvestre's *Universal Palæography*, translated and edited by sir F. Madden (Lond. 1850); *Traité de Diplomatique*, par deux Religieux Benedictins de la Congrégation de St. Maur (Par. 1755).

UNCLEANNESS, in the Old Testament, betokens a state of bodily infirmity which, for the time being, excluded the sufferer from the "holy community," and which, by the various ceremonies connected with the gradual recovery from this exceptional state, went far to impress the people with the constantly reiterated connection between them and God, and their own destination of being "a holy people." No less did the strict cleanliness enforced by the constant fear of becoming an "outcast" for however brief a period, and the strict supervision exercised by the priests, to whom the sanitary well-being was to a certain extent intrusted, act in a salutary manner. Birth, death, the different sexual functions and infirmities, were all, in different manner, causes of uncleanness, and treated according to their different degrees. To a certain extent, some incongruous admixtures of plants, animals, even materials in one garment, etc., may also be reckoned among things that "defiled" or gave rise to a certain uncleanness. Fruits of a tree during its first three years were not to be eaten, as "uncircumcised" or unclean. About the special ways in which uncleanness was treated, we have spoken under PURIFICATION, where also the similarity that has been found between the Jewish laws on these points and those of the Persians and Indians, is touched upon. The uncleanness of the leper is specially treated under LEPROSY.

UNCLE SAM. See NATIONAL NICKNAMES.

UNCLE TOM. See HENSON, JOSIAH.

UNCONFORMABLE STRATA are strata which rest on the more or less inclined edges of older beds. The existence of unconformability in a series of strata is an indication of an interval sufficiently long to permit of the consolidation, disturbance, and upheaval, denudation, and subsequent depression of the inferior beds. No indication of the period that has intervened is to be found in the unconformability itself; but some idea of it may be obtained by an examination of the strata that are known to have been deposited subsequent to the inferior rocks, and previous to the overlying unconformable deposits. Thus, in the n. of Annandale, the Silurian basement rocks, which have often

an almost perpendicular dip, are covered by permian sandstone, and this, again, by the bowlder-clay, or alluvial deposits. The first break in the strata represents the time during which the Devonian and carboniferous rocks were deposited, when, in all probability, the Silurian strata formed a dry land surface, and supplied some of the materials for these rocks. The second break is all the indication in that district of the lengthened period during which the whole of the secondary and tertiary strata were being deposited elsewhere. The temporal value of the break is not so easily determined, in the majority of cases. It is only in one place in Britain, in a cutting of the St. Helen's railway near Ormskirk, where any apparent unconformability exists between the Bunter and Keuper strata, and even there it is so slight that it was long overlooked; yet this break represents a gap which on the continent is filled by the important sets of strata, the muschelkalk and St. Cassian beds, containing two great assemblages of fossils perfectly distinct from each other. Very frequently, however, no beds are known which fill up the gap between the two unconformable series.

The not taking into account the existence of unconformable stratification, has frequently caused a useless expenditure of money in searching for minerals. It seemed natural to expect that the permian rocks of upper Annandale covered beds of the true coal-measures, but an examination of the numerous natural sections where the base of the permian sandstone is seen, shows that it rests on the Silurian rocks; and the necessarily abortive attempts that have been made to reach coal through the red sandstone have been simply a useless throwing away of money.

UNCONSCIOUS CEREBRATION. See CEREBRATION, UNCONSCIOUS.

UNCTION (Lat. *unctio*, an anointing, from *ungo*, I anoint), the practice of anointing the body, or certain portions of the body, with oil, especially with the oil of olives. It was resorted to by the ancients from motives of health (see OILS), of athletic development, or of luxury; but the practice is noticeable here chiefly in its relations to religion. Anointing with oil seems to have been supposed to carry with it the same effects in spiritual things which it produces in the natural world. It was a rite in frequent use among the Egyptians, as well as the Greeks and Romans; and the Scriptural narrative of the ante-Mosaic religion contains distinct evidence of its use (Gen. xxviii. 18, xxxi. 13). In the Mosaic ceremonial, its use is still more frequent. Priests and kings were anointed on being set apart for their several offices; as were also sacred vessels. The oil employed in these religious unctions was prepared of the most precious perfumes and balsams, and Ezekiel rebukes the Jews (xxiii. 41) for making a similar unguent for their personal uses. The special significance of the rite of unction may be inferred from the circumstance that the popular name of the expected Messiah was the Christos, i.e., the Anointed. In Christian use, anointing from a very early time possessed the same sacred significance. See EXTREME UNCTION. Besides the anointing of the sick, however, there are many other sacred unctions traceable in ancient Christian practice; namely, in baptism, in confirmation, in the ordination of priests and other clergy, in the consecration of churches and altars, the benediction of sacred vessels and utensils, etc. It has also been employed in the coronation of kings; and in some countries, curious traditions and legends are preserved connected with the unction of the king, or arising out of it. See RHEIMS.

UNDERGRADUATE, a student of a university or college who has not yet taken his first degree.

UNDERGROUND RAILROAD, a name in common use before the civil war, as applied to the arrangement by which fugitive slaves were enabled to reach Canada. The "stations," on this railroad, which had many branches, were the houses of abolitionists, who secreted the fugitives during the day, and at night passed them on, till by devious routes they crossed the United States border. One of the best patronized branches of the Underground Railroad began at Cincinnati.

UNDERGROUND RAILWAYS. See RAILWAYS; SUBWAYS.

UNDERHILL, JOHN, 1597-1672; b. England; a soldier, who emigrated to Boston with the elder John Winthrop. In 1637 he led the colonial force, which, in conjunction with Capt. Mason's force, burned the Pequot forts at Mystic, Conn., crushing the power of that tribe, of which he wrote a history in England, having been forced to leave Boston on account of his religious opinions. He was governor of Exeter and Dover in 1641, and afterwards settled in Connecticut. He was a member of the general court at New Haven in 1643, and conspicuous in the Dutch-Indian war, 1643-46.

UNDER-LEASE, an alienation by the tenant of a portion of his lease, with a reservation to himself of the reversion. An assignment, on the contrary, is a transfer of the tenant's entire interest in the lease. The tenant and the sub-lessee stand in the relation of landlord and tenant, but between the original landlord and his tenant's lessee there is no priority of estate or contract. The sub-tenant has the same rights to the possession of the premises as his landlord, the original lessee, and no more; so that the original lessor, entering for breach of condition, may dispossess the sub-lessee.

UNDERWOOD, ADIN BALLOU, b. Mass., 1828; graduated at Brown university, was admitted to the bar, and settled in Boston in 1855. He served in the civil war of 1861-65, was col. of the 33d Mass. infantry in 1862, was at Fredericksburg, Gettysburg, and other battles, and was severely wounded at Lookout Mountain. He was brevetted

maj.-gen. in 1865. He was appointed surveyor of the port of Boston in 1865, and long held that office. He d. 1888.

UNDERWRITER AND UNDERWRITING. See INSURANCE.

UNDINES' (perhaps from *unda*, a wave), the name given in the fanciful system of the Paracelsists to the elementary spirits of the water. They are of the female sex. Among all the different orders of elementary spirits, they intermarry most readily with human beings, and the Undine who gives birth to a child under such a union, receives with her babe a human soul. But the man who takes an Undine to wife must be careful not to go on the water with her, or at least not to anger her while there, for in that case she will return to her original element. Should this happen, the Undine is not disposed to consider her marriage dissolved; she will rather seek to destroy her husband, should he venture on a second marriage. Baron de la Motte Fouqué has made this Paracelsist fancy the basis of an exquisite tale, entitled *Undine*.

UNDULATORY THEORY OF LIGHT. Optics ranks next to dynamics in the category of nearly *exact* sciences—that is, of sciences whose fundamental principles are so well known, that the result of almost any new experimental combination can be predicted mathematically. Given the forces acting on a body, the laws of motion (q.v.) enable us, by purely mathematical processes, to determine the consequent motion. Though we have not as yet arrived at equal perfection in optics, we are certainly far on the way, and probably have now attained nearly all the progress (independent of improvements in our mathematical methods) which will be made until the next great step in molecular physics shall give us the clue to the nature of the minute motions on which light, heat, electric currents, and magnetism depend. The most extraordinary and almost incredible predictions of theory have been verified by experiment, and at present the differences between theory and experiment may be divided into two classes, corresponding to the above exceptions. The first are those depending on the imperfections of mathematical processes, where, because, for example, as we are yet unable to obtain the exact solution of a certain differential equation, we have to content ourselves with an approximate one. But every improvement in our means of approximation is found to introduce a closer agreement between theory and experiment. This difficulty may safely be left to mathematicians. It is otherwise with the second difficulty. This depends on our ignorance of the ultimate nature of matter, and our consequent inability to apply mathematical reasoning in a perfectly correct and sufficiently comprehensive manner. Here the experimenter's work is still required, and it is in this direction that we must in all probability now look for important extensions of our knowledge.

Optics is divided into two parts, *physical* and *geometrical*. Of these, the latter contents itself with assuming certain obvious experimental truths, such as the fact, that light in a uniform medium moves in straight lines, the ordinary laws of reflection and refraction, etc., and, making these its basis, employs mathematics to develop their further consequences. It is thus that theory has shown how to carry to their utmost perfection such exquisite specimens of art as the best telescopes and microscopes of the present day. But these investigations, and their practical application, are wholly independent of the nature of light, and cannot be affected by discoveries in that direction.

It is otherwise when we come to physical optics. This commences with the question: "*What is Light?*" and endeavors to deduce from the nature of light the experimental laws which, as we have seen, are assumed as the basis of geometrical optics.

By two perfectly distinct classes of astronomical observations—aberration (q.v.), and the eclipses of Jupiter's satellites—we know that light takes *time* to pass from one body to another—the velocity, however, being enormous—about 200,000 miles per second. Hence it follows, that either *matter* (q.v.) or *energy* (see FORCE) must be transferred from a body to the eye before we can see it. Here we have at once the rival physical theories of light, which have alternatively had the advantage of one another in explaining observed phenomena. It is only of late years that an *experimentum crucis* has finally decided between them—by showing one of them to be utterly incompatible with a result of observation.

Newton adopted the corpuscular theory, in which light is supposed to consist of material particles—i.e., he adopted the first of the two possible hypotheses; and he gave the first instance of the solution of a problem involving molecular forces, by deducing from this theory the laws of reflection and single refraction. We shall see immediately that this beautiful investigation led to the destruction of the theory from which it was deduced. But, independent of this, there are many grave and obvious objections to the corpuscular theory; for it involves essentially the supposition of material particles impinging on the eye with the astounding velocity of 200,000 m. per second! If such particles weighed but the millionth of a pound, each would have something like ten times the momentum (q.v.), (i.e., the battering power), and *six million* times the vis-viva (see WORK), or kinetic energy (i.e., the penetrating power), of a rifle-bullet. Suppose them a million times smaller—yet as millions of millions of them must be supposed to enter the eye at once, coming from every point of the surface of every visible object, it seems impossible to reconcile such a hypothesis with the excessive delicacy of the organs of vision.

It is not pretended by the advocates of the rival hypothesis, the undulatory theory of light, that they understand exactly the nature of the transference of energy on which they suppose light to depend; but they take from the analogy of sound in air, and of waves in water, the idea of the existence in all space of a highly elastic fluid (or quasi-solid), provisionally named the *ether* (q.v.), and they suppose light to consist in the propagation of waves in this fluid. Huygens has the credit of having propounded, and ably developed and illustrated, this theory.

As we have seen above, no third hypothesis as to the nature of light is admissible. Many strong arguments against the truth of the corpuscular theory had been furnished by experiment, especially in the early part of the present century; and as they were always met by further and more extraordinary properties which had to be attributed to the luminous corpuscles, the theory had become complicated in the most fearful manner; and this of itself was an almost complete disproof. Still, it held its ground, for Newton's old objection to the rival theory, viz., that on the undulatory hypothesis there should be no shadows at all (witness the analogy of sounds heard round a corner), was as yet unanswered. This difficulty was overcome by Young (q.v.), to whose sagacity we are indebted for the idea of *interference* (q.v.), which completely explained the apparent discrepancy. But the question between the rival theories was finally settled by Fizeau and Foucault, who, by processes entirely different, but agreeing in their results, determined the velocity of light in air and in water.

Now, Newton had shown that refraction, such as that of light by water, if predicated of moving *particles*, requires that they should move faster in water than in air. Huygens, again, had shown, that if such refraction be predicated of *waves*, they must move

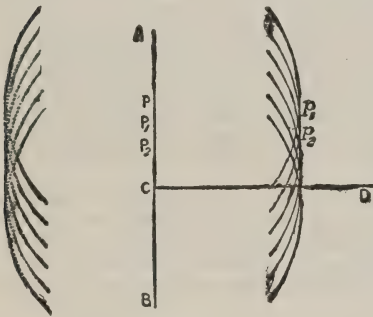


FIG. 1.

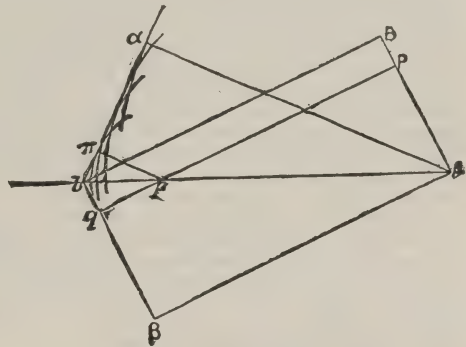


FIG. 2.

slower in water than in air. Fizeau and Foucault found, by direct measurement, that light moves slower in water than in air. Hence it is certain that *light consists in the transference of energy, not of matter*; and the undulatory theory is based upon this fact.

But, as to the manner in which energy is thus transferred, we are entirely ignorant. The common assumption is, that waves of distortion are propagated in the *ether*. The nature of this motion will be described under *WAVE*. But many other modes have been suggested, one of the most notable of which is that of Rankine. Here the particles of *ether* are not supposed to be *displaced*, but each is merely made to turn about an axis as the wave of light passes it; the particles having polarity (q.v.), by virtue of which they arrange themselves in similar positions when no light is passing, and by which, also, any rotation of one particle produces a consequent rotation of those in its neighborhood. For the explanation of most of the common phenomena of optics, it is quite indifferent which of these assumptions we make, and, indeed, theory has not yet been carried far enough to enable us to devise experimental methods of testing which is the more likely to be the case in nature. It cannot be too strongly insisted on that all we know at present is, that light certainly depends on the transference of energy from one part of the luminiferous medium to another; what kind of energy is transferred, vibratory or oscillatory motion, or rotation, etc., is a problem which may possibly forever remain unsolved. But vibratory wave-motion being that with which we are most familiar, as in earthquakes, sound, waves in water, etc., we naturally choose this as the most easily intelligible basis of explanation and illustration. And we shall now briefly show how the laws of linear propagation, reflection, single refraction, interference, diffraction, dispersion, polarization, and double refraction may be accounted for.

We assume, then, that light consists in a succession of waves, and for our earlier inquiries it does not matter whether they be (like those of sound) waves of condensation and rarefaction, in which the vibrations take place *in* the direction of the ray, or (like those in water) waves of distortion or displacement without condensation, in which case the luminous vibrations must be assumed to take place in some direction *perpendicular*

describes 200,000 m. per second, the number of waves which enter the eye per second are:

| | |
|------------------|---------------------------|
| Extreme Red..... | 460 millions of millions. |
| “ Violet..... | 730 “ “ |

These numbers, compared with those of sonorous waves (see SOUND), show the extraordinary difference in delicacy between the optic and auditory nerves. But whereas the range of the ear is somewhere about 12 octaves, that of the eye is less than one.

Diffraction.—This has been already illustrated in a previous volume.

Dispersion.—We have just seen that, by Fresnel's interference experiment, waves of different length are separated (for in the last figure the position of the bright line, V, depends on the length of the waves which produce it). But the different colors are also separated by common refraction, as in Newton's celebrated experiment. See SPECTRUM. This shows, of course, that in refracting media, waves of different colors move with different velocities; and, as the violet are more refracted than the red, it appears that the shorter waves move more slowly in glass or water than the longer ones. In free space, waves of all lengths travel with equal speed, else (see ABBERRATION) all stars ought to appear drawn out into spectra, in consequence of the earth's annual motion. Also, a star suddenly breaking out, or suddenly vanishing (a phenomenon several times observed), should flash out first red, and gradually become white, or should gradually decay from white to violet, which is not observed to be the case. These facts are the most difficult to explain of any to which the undulatory theory has yet been applied. Fresnel, indeed, appears to have been in possession of a solution of the difficulty, but the appendix to one of his papers, to which he more than once refers as containing this explanation, was not found among his MSS. Cauchy and others have, however, by delicate investigations, shown that, *if the forces exerted by the molecules of a refracting body on the ether are exerted through distances comparable with the length of a wave*, the velocity of light will then depend on the wave-length. The velocity is, in fact, shown to be represented by a formula such as this:

$$A - \frac{B}{\lambda^2}$$

where A and B are constant quantities for a given medium, and λ is the length of a wave, The larger λ is, the less is the second term of the formula, and therefore the velocity is the greater. A very singular result follows from this formula—viz., that the velocity becomes

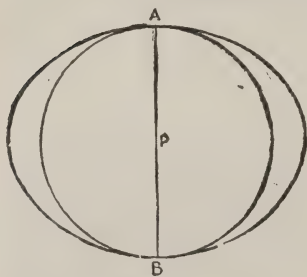


FIG. 6.

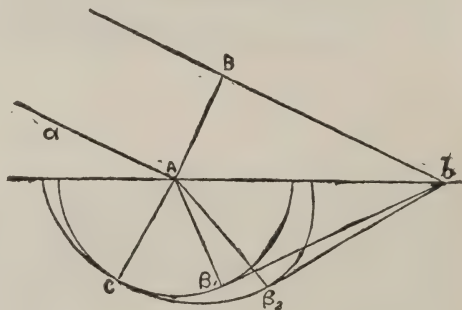


FIG. 7.

more and more nearly equal to A as the wave length is greater. Hence, waves of low radiant heat, which (see HEAT) are merely waves of light which are incapable of producing vision, must be crowded together toward a limit, not very far beyond the red end of the spectrum.

Polarization.—We now come to a set of phenomena which give us some further information as to the nature of luminiferous waves. When two beams of light, such as those in Fresnel's experiment, are polarized in planes perpendicular to each other (see POLARIZATION) before they meet, *they do not interfere*. This is in accordance with the assumption required for the explanation of the existence of polarization itself—viz., that the vibrations of the ether take place *transversely* to the direction of the ray.

Double Refraction.—Our assumptions, forced upon us by experimental results, are now so far complete that we may proceed, after Fresnel, to apply them to the explanation of double refraction. See POLARIZATION; REFRACTION, DOUBLE. This explanation is extremely beautiful, and when published, was justly hailed as the greatest step in physical science which had been made since Newton deduced the facts of physical astronomy from the law of gravitation.

As we have seen above, in treating of simple reflection and refraction, that the form and velocity in and with which a disturbance spreads from any point of a wave, is all

that is required for the determination of the course of a ray, we must endeavor to find the form in which a disturbance spreads in a double-refracting crystal; and this should lead us to a construction for each of the two rays.

Huygens had already pointed out that one of the two rays produced by Iceland spar follows the ordinary law of refraction. Hence the disturbances which give rise to this ray are propagated in spherical waves in the crystal. He showed also that the other ray could be accounted for, if the disturbances to which it is due were propagated in the form of an oblate spheroid touching the sphere with the extremities of its axis, that axis being parallel to the crystallographic axis of the mineral. The following diagram (fig. 6) will make this clear: P is the point where the ether is disturbed. Two waves spread from P in the form shown in the cut, the line ABP being the axis of rotation of the spheroid, and parallel to the axis of the crystal. Thus, let rays αA , etc. (fig. 7), of which AB is the wave-front, fall upon the surface Ab of such a crystal; and let AC be the direction of its axis. Draw, about A as a center, the sphere and spheroid into which the disturbance at A spreads in the crystal while light in air passes from B to b. Then if planes be drawn through the line b (perpendicular to the paper) so as to touch the sphere in β_1 , and the spheroid in β_2 , these planes will touch respectively all the intermediate spheres and spheroids produced by disturbances at points between A and b. [This is evident from simple geometry.] Thus, $b\beta_1$ and $b\beta_2$ are the new wave-fronts; and the ray αA , falling on the crystal, is divided into the two $A\beta_1$ and $A\beta_2$. Of these, $A\beta_1$ is the ordinary ray, and being produced by spherical waves, has all the properties of a ray ordinarily refracted. It obviously moves perpendicularly to its front, as $A\beta_1$ is perpendicular to $\beta_1 b$.

But it is otherwise with $A\beta_2$, which is, in general, *not perpendicular to its front*, $\beta_2 b$. Again, if AC, the axis of the crystal, be not in the plane of incidence, the ray $A\beta_2$ is not in that plane; so that here we have *refraction out of the plane of incidence*.

The exact accordance of this construction with observation was proved by the careful experiments of Wollaston. We have only to add, that the two rays $A\beta_1$ and $A\beta_2$ are, in all cases, completely polarized in planes at right angles to each other.

The experiments of Brewster showed that in by far the greater number of minerals and artificial crystals, *both* rays are extraordinary—i. e., neither of them can be accounted for by disturbances propagated spherically in the crystal. But no tentative process could lead to the form of the wave-surface in this most general case. Here Fresnel's genius supplied the necessary construction.

He assumes that the ether in a crystallized body is possessed of different rigidity, or different inertia, in different directions; a supposition in itself extremely probable, from the mechanical and other properties of crystals. In the general case there are shown to be three principal directions in a crystal, in any one of which, if the ether be displaced, the resulting elastic force is in the direction of the displacement. Each of these is, in all cases, perpendicular to the others. Any given displacement of the ether corresponds to partial calculable displacements parallel to each of these lines, and thus the elastic force consequent on any displacement whatever is known if we know those for the three rectangular directions. All the calculations are thus dependent on *three* numbers only, for each substance.

To find the form in which a disturbance will spread, Fresnel proceeds as follows: Let the plane of the paper represent the front of a wave in the crystal, and suppose a particle of ether to be displaced in it from A to B (fig. 8). This displacement may be resolved (by the law of the parallelogram of velocities, forces, etc.) into two components in any two directions in the plane of the paper. Assume AP to be one of these, and let PQ be the force produced by disturbing the particle of ether from A to P. In general PQ will *not* lie in the plane of the paper. Let fall a perpendicular, QR, upon the plane of the paper. In general the point R will not lie in AP. The portion RQ, of the elastic force of the ether, Fresnel neglects, because it would produce vibrations perpendicular to the wave-front, i. e., *similar to those of sound*, and he assumes that such normal vibrations do not produce visible light. We shall recur to this point. Fresnel now assumes that the vibrations which will be propagated continuously in the crystal are such as have PR coincident in direction with AP; and then the rate of their propagation will depend upon the ratio of PR to PA. He shows by mathematical reasoning that there are *two* such directions in every wave-front, and that they are always *perpendicular* to each other. This, of course, at once accounts for double refraction, the complete polarization of each of the two rays, and their being polarized in planes perpendicular to each other. The original plane wave is now broken into two, both parallel to the first, but in general moving at different rates. He next considers a disturbance at any point in a crystal as equivalent to waves having fronts in *every* plane passing through that point, and investigates mathematically the form of the surface which is touched by the planes of all the pairs of polarized rays which have (in any given time) proceeded from each of those wave-fronts. The form of this surface is very remarkable. It is symmetrical with reference to three planes at right angles to each other. These, of course together, cut it into eight parts, one of which is figured below (fig. 9). From this it appears, though Fresnel did not perceive it, that the surface has four *conical cusps*, as they are called, the inner portion seeming to be drawn through a hole, as it were, and then spreading out again to form the outer portion. The external appearance of these points very much

resembles the portion of an apple round the point of attachment of the stalk. Fresnel showed that, in particular cases, when two of the three principal elasticities are equal, this surface degenerates into the sphere and spheroid of Huyghens already described for Iceland spar; and that, when all three are equal, it becomes a single sphere, as in glass, water, and other singly refracting bodies. All this, of course, is in complete accord with experiment. But there is vastly more. If we use the wave-surface of Fresnel to construct the refracted rays, just as we employed the sphere for simple refraction, or the sphere and spheroid for Iceland spar, we find generally *two* definite refracted rays (both usually out of the plane of incidence) for one incident ray. But Hamilton, who was the first to perceive the existence of the cusps already described, saw that they indicated the existence of a very remarkable phenomenon, to which he gave the name of conical refraction (q. v.). The ray which, in the crystal, passes from A to C (the cusp, see last figure), has not, like other rays such as ApP, to definite wave-fronts. For if at p and P, where the line ApP meets the inner and outer portions of the wave-surface, we draw tangent planes, these are the definite fronts of the corresponding waves; so that such a ray will split into two only, on leaving the crystal. But AC intersects the surface at C, where it is *conical*, and has an *infinite* number of tangent planes, so that when it leaves the crystal it will split into an infinite number, forming a hollow cone. Hamilton's prediction then was: If a single ray of light be made to pass through a plate of a biaxial crystal in the direction AC (limiting it, for instance, by sheets of tin-foil with small holes in them properly fixed on each side), it will enter and emerge as a hollow cone. Also the plane of polarization will differ for different rays in this cone. Lloyd completely verified this wonderful prediction by experiments made with a plate of *aragonite* (q. v.). But more, Hamilton observed that (see last figure) the wave surface can be

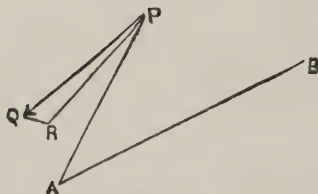


FIG. 8.

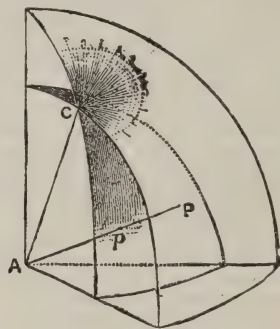


FIG. 9.

touched by a tangent plane in a circle surrounding the cusp. If, then, we make the construction of fig. 7 with Fresnel's wave instead of the sphere and spheroid, there will be a definite direction of the incident ray αA , for which the tangent planes $b\beta_1$ and $b\beta_2$ in that figure will coincide, and will touch the wave-surface in the circle about the cusp. Any line drawn from A to a point in that circle will be a direction for a refracted ray. Hence the ray αA will be broken up into a hollow cone of rays, the vertex of the cone being A, and its base this circle. If the crystal be cut into a plate each ray will of course emerge parallel to αA , and the *ensemble* of them will form a hollow cylinder. The prediction, then, is that a single definite ray, falling in a given direction on such a plate of crystal, will emerge as a hollow cylinder. This and the predicted laws of the polarization of the light of the cylinder were also verified by Lloyd.

"The formulæ which led to such triumphantly successful predictions *may* have been deduced from incomplete or even erroneous premises; but they *represent a truth*, and must in time conduct us step by step back to ultimate proof of the truth of Fresnel's assumptions, and of the undulatory theory of light, as now understood, or show us what modifications may be required in the original conceptions."

It would unduly lengthen this article, and besides would lead us into discussions far too recondite for a work like this, to enter upon the question of whether the vibrations in polarized light are *perpendicular* to or *in* the plane of polarization, a subject which has recently been well investigated by Stokes (q. v.); or to consider the production of elliptically polarized light by reflection at the surface of metals, diamond, etc.; and various other most important points of the theory. We can only mention that Green, Cauchy, Stokes, and others, who have entered deeply into the mechanical question of luminiferous vibrations, have found themselves obliged to take into account the *normal* wave, which, as we have seen, Fresnel neglected.

Fluorescence (see PHOSPHORESCENCE), spectrum analysis (see SPECTRUM), and various other important recent additions to the theory, must be merely mentioned; as also the very remarkable observation of Maxwell, which appears to connect light and electricity, and was derived from a theory which assumes the ether to be the vehicle of electricity

and magnetism as well as of light and heat, and by which it appears that the velocity of light is expressible in terms of the static and kinetic units of electricity.

For further information, we refer the reader to Lloyd's *Wave-theory*, an excellent elementary treatise; while to the more advanced mathematician we may commend Airy's *Tract on the Undulatory Theory*.

UNDY, in heraldry, the same as wavy. See **HERALDRY**.

UNEARNED INCREMENT. A term used by Mr. Henry George (q.v.) in his economic writings to designate the rise in the value of land due to the general development of the community and to the gradual occupation of all the land in it. This rise in value being due to the industry, thrift, and activity of others, is thus a gift from the community as a whole, to the individual land owner. See **SINGLE TAX**.

UNFERMENTED BREAD. See **AERATED BREAD**.

UNG, a co. in n.e. Hungary, bordering on Galicia, 1176 sq. m.; pop. '90, 135,247, the majority of whom are Slavs, and Magyars. It is crossed by the Carpathian mountains, which are rich in deposits of coal, iron, and other valuable minerals. Capital, Ungvár.

UNGER, FRANZ, a German geologist and botanist, was born in Styria in 1800. He studied medicine, taking his degree in Vienna, in 1827, and practiced until 1836, when he left his profession and became professor of botany and director of the botanical garden at Gratz. He remained here until 1850, when he became professor in the university of Vienna. During the later years of his life he made several scientific journeys, notably in Denmark and the Scandinavian peninsula, in Egypt and Syria. He died in Gratz in 1870. His principal works are: *Anatomie und Physiologie der Pflanzen* (1855); *Botanische Streifzüge auf dem Gebiete der Kulturgeschichte* (1857 et seq.); *Sylloge Plantarum Fossilium* (1860); *Die Fossile Flora von Kumi in Eubœa* (1867); *Geologie der europäischen Waldbäume* (1869); and *Ueber Lieschkolben der Vorwelt* (1870).

UNGER, JOHANN FRIEDRICH, an eminent printer and wood-engraver, was born in Berlin, in 1750. He was the son of Johann Georg, and worked with his father until he became professor of wood-engraving in the Academy of Plastic Arts in Berlin. He was also the inventor of a peculiar kind of type. He died in 1804.

UNGER, JOHANN GEORG, an eminent wood-engraver, was born near Berlin, in 1715. He was particularly eminent for improvements in printing and engraving. Some of his engravings of landscapes are considered masterpieces even in these days. He died in 1788.

UNGER, JOSEPH, jurist and statesman, b. in Vienna, Austria, in 1828, studied law in that city and after holding a professorship at Prague, returned to Vienna to become a professor in the university. He was greatly interested in the constitutional questions of Austria, and, in collaboration with Fischhof, published *Zur Lösung der ungar. Frage* (1861). He became a member of the lower Austrian landtag, and later of the reichsrath, where he was active on behalf of the liberal programme. From 1871 to 1879 he was a minister without a portfolio, and in 1881 became the president of the imperial court. His chief work was an attempt to systematize the Austrian private law, and was published under the title of *System des österr. allgemeinen Privatrechts*. Among his other works are *Das österr. Erbrecht*; *Der Entwurf eines bürgerlichen Gesetzbuches für das Königreich Sachsen, mit besonderer Rücksicht auf das österr. allgemeine bürgerliche Gesetzbuch besprochen*; *Die rechtliche Natur der Inhaberpapiere*; *Die Verlassenschaftsabhandlung in Oesterreich*. With J. Glaser and others, he published *Sammlung von civilrechtlichen Entscheidungen des k. k. obersten Gerichtshof in Wien* (1859-92).

UNGUENTS, or **OINTMENTS**, are employed in medicine as external applications. They consist of some active agent in solution or in the form of a soft extract, or in fine powder, carefully rubbed up with some kind of fatty matter, or a mixture of several such matters, as prepared lard, prepared suet, white wax, yellow wax, olive-oil, and almond oil. There are no less than 28 ointments in the British *Pharmacopœia*. Some, as the ointments of aconitia, atropia, and belladonna, are employed to allay neuralgia and local pains; simple ointments (consisting of white wax, prepared lard, and almond oil) are employed in dressing raw and blistered surfaces; the ointments of cantharides and of savin are used to keep up the discharge from issues or blistered surfaces; the ointments of creosote, galls, carbonate of lead, oxide of zinc, etc., serve as astringents; those of ammoniated mercury, calomel, nitrate and red iodide of mercury, iodine, iodide of potassium, elemi, resin, and turpentine, act as astringents of varying power, and that of red oxide of mercury as a mild caustic. Many of the ointments are of special service in skin diseases, and sulphur ointment is the specific application for itch.

UNGUICULA TA (Lat. clawed), in zoology, a section of the class mammalia, consisting of those animals which have toes furnished with nails or claws. In the system of Linnæus, it includes the orders *bruta*, *glîres*, *primates*, and *feræ*; in that of Cuvier, the orders *bimana*, *quadrumanâ*, *carnaria*, *marsupialia*, *rodentia*, and *edentata*.

UNGULA TA (Lat. hoofed), in zoology, a section of the class mammalia, consisting of those animals which have hoofs. In the system of Linnæus, it includes the orders *belluæ* and *pecora*; in that of Cuvier, the orders *pachydermata* and *ruinantia*.

UNGULED, in heraldry, a term applied to the tincture of the hoofs of an animal; e.g., azure, a stag trippant or, attired and unguled gules, the arms of the family of Strachan in Scotland.

UNGVÁR', (slav. *Uzgorod*) an important market t. in the n.e. of Hungary, is charmingly situated on the river Ung, 90 miles n.n.e. of Debreczin. It is the residence of a bishop, and contains a very old castle, a beautiful church, a seminary, and gymnasium and important potteries. Trade is carried on in salt, cattle and wine, particularly the last, vines being extensively cultivated in the vicinity. Population, in 1890, 11,793.

UNICOL, a co. in e. Tennessee, separated from North Carolina by a range of the Iron mountains; about 196 sq. m.; pop. '90, 4619. Co. seat, Erwin.

UNICORN (Lat. *unum cornu*, one horn), an animal probably fabulous, mentioned by ancient Grecian and Roman authors as a native of India, and described as being of the size of a horse, or larger, the body resembling that of a horse, and with one horn of a cubit and a half or two cubits long on the forehead, the horn straight, its base white, the middle black, the tip red. The body of the animal was also said to be white, its head red, its eyes blue. It was said to be so swift that no horse could overtake it. The oldest author who describes it is Ctesias, who resided for many years as physician at the court of Artaxerxes Mnemon, and who wrote about 400 B.C. His information, however, was all at second-hand. He calls it the wild ass (*onos agrios*). Aristotle briefly mentions it under the name of Indian ass, saying: "We have never seen a solid-hoofed animal with two horns, and there are only a few of them that have one horn, as the Indian ass and the oryx." Pliny nearly follows Aristotle, but says that the Indian ass is one-hoofed, and the oryx two-hoofed. He speaks also of the *monokeros*, a very fierce animal, with the body of a horse, the head of a stag, the feet of an elephant, the tail of a wild boar, and a single horn. All these accounts are evidently untrustworthy, and much tinged with fable. Not more credible are those of more modern authors. Lobo, in his *History of Abyssinia*, describes the unicorn as resembling a beautiful horse; but there is no good evidence of the existence of any such animal there or in any part of the world. Its existence, however, is not to be decided against on any other grounds; for there does not appear to be anything monstrous or absurd in the notion. Although the descriptions of the unicorn given by the ancients are very unlike the Indian rhinoceros, yet probably that animal was the origin of them all. In like manner, it seems probable that the head of a unicorn, which Barrow saw depicted on the side of a cavern in south Africa, and the head of a unicorn described and figured by Campbell in his *Second Journey in South Africa*, are to be referred to some species of rhinoceros. The word unicorn is unhappily used in versions of the Old Testament for the Hebrew *rêem*. The Septuagint led the way in this, by using the Greek *monokeros*; and it has been supposed by many that the animal meant is a rhinoceros. The *rêem* was, however, certainly not a one-horned, but a two-horned animal. In Deut. xxxiii. 17, where the English version has "horns of unicorns," the correct translation is "horns of a *rêem*." Other circumstances, as an allusion to the gamboling of the young, are also unfavorable to the idea that a rhinoceros is intended.

The unicorn is perhaps best known as a heraldic charge or supporter. Two unicorns were borne as supporters of the Scottish royal arms for about a century before the union of the crowns; and the sinister supporter of the insignia of the United Kingdom is a unicorn argent, armed, crined, and unguled or, gorged with a coronet composed of crosses patée and fleurs-de-lis, with a chain affixed, passing between the fore-legs, and reflexed over the back, of the last.

UNIFORM (one form), in its military and naval sense, means the particular dress and equipment assigned by proper authority to each grade of officers and men. The clothing consists of one prevailing color, variously ornamented and "faced" according to the rank and corps. Although some regiments wear other colors, scarlet may be said to be the prevailing uniform of the British army; blue of the French; and white of the Austrian; dark blue is likewise the color of the British navy. It is surprising how late the introduction of compulsory uniforms took place. We find soldiers serving with corps and yet dressed after the dictates of their own fancy well into the 17th c.; while in the navy uniforms were not fixed with certainty until the beginning of the reign of king George III.

UNIFORMITY, ACT OF. See NONCONFORMISTS.

UNIGENITUS, BULL, one of the most important documents in the history of Jansenism. It was occasioned by the publication of the *Réflexions Morales* of Quesnel (q.v.), in which all the essential principles of Jansenism were revived, and although cautiously, yet systematically explained, so as to form the basis of that practical, moral, and religious teaching which it is the object of the *Réflexions Morales* to convey. The book was at first simply prohibited by a brief of pope Innocent XI., in the year 1708; but, as it found many patrons, and especially the archbishop of Paris, cardinal de Noailles, it was deemed necessary to subject it to a more detailed examination, the result of which was that 101 propositions were extracted from it, and formally condemned, in 1713, by a bull commencing with the word "Unigenitus." The mode of condemning these propositions was peculiar, being that which is technically called *damnatio in globo*. The whole body of propositions were condemned as "heretical," "false," "rash," "scandalous," "offensive to pious ears," etc.; without, at the same time, any particular propositions being pointed out as deserving any one of these specific forms of censure. This circumstance, with

others, gave rise to much controversy, and to a prolonged opposition to the bull. De Noailles and other bishops refused to accept it unless with certain qualifications; on the contrary, Louis XIV. insisted on unconditional acceptance; but on the death of Louis, the regent, the duke of Orleans, having given his countenance to the opponents of the bull, the resistance was persisted in; and eventually a declaration was put forth in 1717, by certain bishops, four in number, appealing from the pope to a general council. This appeal was condemned by the pope, nor was it countenanced even by the regent; but a more modified appeal "from the pope ill-informed to the pope better-informed," was afterward published by De Noailles, which obtained many adherents, and by which the opposition was kept alive to the end of the pontificate of Clement XI. in 1721, and even under his successors, Innocent XIII. and Benedict XIII. It was not till the year 1730 that, after the formal registration of the bull *Unigenitus* by the parliament of Paris, the party thus created in France, and known under the name of "appellants," received its final condemnation from the civil authority, after which it gradually died out, although some relics of it are still traceable, even after all the storms of the revolution, in the so-called "Petite Eglise." See GALLICAN CHURCH.

UNION, a co. in s. Arkansas, having the Ouachita river for its e. boundary; 1138 sq.m.; pop. '90, 14,977. Co. seat, Eldorado.

UNION, a co. in n. Georgia, containing a range of the Blue Ridge; 325 sq.m.; pop. '90, 7749. Co. seat, Blairsville.

UNION, a co. in s. Illinois, having the Mississippi river for its w. boundary, separating it from Missouri; 400 sq.m.; pop. '90, 21,549, chiefly of American birth, with colored. Co. seat, Jonesboro.

UNION, a co. in e. Indiana, bounded on the e. by the state-line of Ohio; 170 sq.m.; pop. '90, 7006. Co. seat, Liberty.

UNION, a co. in s. Iowa; 432 sq.m.; pop. '90, 16,900. Co. seat, Creston.

UNION, a co. in w. Kentucky, having the Ohio river for its w. and n.w. boundary, separating it from Indiana and Illinois; 380 sq.m.; pop. '90, 18,229. Co. seat, Morganfield.

UNION, a parish in n. Louisiana, having the Ouachita river for its e. boundary; 905 sq.m.; pop. '90, 17,304. Parish seat, Farmerville.

UNION, a co. in n. Mississippi; 424 sq.m.; pop. '90, 15,606, chiefly of American birth. Co. seat, New Albany.

UNION, a co. in n.e. New Jersey, having Newark bay and Staten Island sound for its e. boundary; about 102 sq.m.; pop. '90, 72,467. Co. seat, Elizabeth.

UNION, a co. in s. North Carolina; 640 sq.m.; pop. '90, 21,259, chiefly of American birth. Co. seat, Monroe.

UNION, a co. in central Ohio; 427 sq.m.; pop. '90, 22,860, chiefly of American birth. Co. seat, Marysville.

UNION, a co. in n.e. Oregon, separated from Idaho by the Snake river, and containing a range of the Blue mountains; about 3035 sq.m.; pop. '90, 12,044, chiefly of American birth. Co. seat, Union.

UNION, a co. in central Pennsylvania, having the w. branch of the Susquehanna river for its e. boundary; 315 sq.m.; pop. '90, 17,820. It is crossed by several ridges of the Alleghany mountains. Co. seat, Lewisburg.

UNION, a co. in n. South Carolina, having the Broad river for its e. boundary; 660 sq.m.; pop. '90, 25,363. Co. seat, Union.

UNION, a co. in s.e. S. Dakota, separated from Iowa by the Big Sioux river, and from Nebraska by the Missouri; traversed by Chicago, Milwaukee and St. Paul, and the Chicago and Northwestern railroads; about 430 sq.m.; pop. '90, 9130, chiefly of American birth. Co. seat, Elk Point.

UNION, a co. in e. Tennessee, intersected by the Clinch river; 220 sq. m.; pop. '90, 11,459. Co. seat, Maynardville.

UNION, a t. in Hudson co., N. J., on the Hudson river, 2 m. n. of the city of Hoboken. Pop. '90, 10,643.

UNION COLLEGE, Schenectady, N. Y., founded in 1795. Union college owes its name to the fact that it was established by the co-operation of several religious denominations. It was the first non-sectarian college in the United States, and has continued to be the representative of religious unity. The college was the first in New York state west of the Hudson river, and the first chartered after the establishment of the United States. The administrations of its three earliest presidents cover but nine years; they were, John Blair Smith (1795-1799), Jonathan Edwards, son of the famous New England divine (1799-1801), and Jonathan Maxcy (1802-1804). In 1804, Eliphalet Nott was made president, and during his presidency, which continued until his death, in 1866, the college became one of the foremost institutions of learning in the United States.

The foundation of the college was due largely to the national feeling of the beginning of the republic, and its national character and influence are indicated by the fact that among its alumni were William H. Seward, and President Arthur, as well as Robert Toombs, of Georgia. The presidents since Dr. Nott's death have been Laurens P. Hickok (1866-1868), Charles A. Aiken (1869-1871), Eliphalet Nott Potter, grandson of Dr. Nott (1871-1884), Harrison E. Webster (1888-1894), and Andrew V. V. Raymond, who entered upon the office in 1894. The college grounds comprise 200 acres of land within the city limits; the buildings include dormitories, chemical, physical and biological laboratories, library, chapel, memorial hall, gymnasium, professors' residences and fraternity chapter-houses. The library numbers about 30,000 volumes. The natural history museum is one of the best in the country. Courses are offered leading to the degrees of A.B., Ph.B., B.S., B.E., and C.E. Generous sums are given in scholarships to students from the proceeds of endowments made for that purpose. Many prizes and other honors are offered.

Union college received by its charter full university powers, but established no professional schools except the school of civil engineering, founded in 1845, the first established by any college in the United States. Independent professional schools were established in Albany, the medical college in 1838, the law school in 1851. The Dudley observatory was founded in Albany in 1856, not for instruction, but for the advancement of scientific knowledge. In 1873, all these institutions were united with Union college to form Union university, the president of Union college becoming chancellor of the university. In 1881, the Albany college of pharmacy was founded and incorporated with Union university. The school of civil engineering added in 1896 a course in electrical engineering, in which unusual advantages are offered by the co-operation of the General Electric Co., whose works are located in Schenectady. The college faculty consisted in 1897 of 27 professors and instructors; the university faculty of 89 professors, instructors, and lecturers. The students in the college numbered 221; medical college, 214; law school, 86; college of pharmacy, 47. Total, 568. Total number of graduates of Union college, 4940; total number living, 2470.

UNION GOODS, a general name for such textile fabrics as are composed of more than one material; but it is applied chiefly to those made from vegetable fibres, as mixtures of flax and hemp, or jute, cotton and flax, etc. This class of manufactures has immensely increased of late years.

UNION IDE. See FRESH-WATER MUSSEL.

UNIONISTS. See POLITICAL PARTIES, ENGLISH.

UNION-JACK (from the *jacque*, or surcoat, charged with a red cross, anciently worn by English soldiers—see JACK), the national banner of the united kingdom of Great Britain and Ireland, formed out of the combination of the crosses of St. George (argent, a cross gules), of St. Andrew (azure, a saltire argent), and of St. Patrick (argent, a saltire gules), these three crosses being the national banners of England, Scotland, and Ireland respectively. The first union-jack, which was introduced by a royal proclamation in 1606, three years after the union of the Scottish with the English crown, combined only the crosses of St. George and St. Andrew, and may be blazoned, azure, a saltire argent surmounted by a cross gules edged of the second. This combination was by royal proclamation of date July 28, 1707, constituted the national flag of Great Britain. On the union with Ireland, a new union ensign was devised, in which the cross of St. Patrick was introduced, with its four limbs edged with white on one side. This awkward specimen of heraldry forms the second and now existing union ensign. Generally speaking, it is displayed as a national ensign on flags only; but the reverse of the bronze coins of the realm contains a not very accurate representation of it on the shield of the seated figure of Britannia. The inaccuracy consists in the crosses of St. Andrew and St. Patrick being made to assume the appearance of a single saltire with a narrow border of equal width on each side.

UNION THEOLOGICAL SEMINARY, in New York City, founded 1836. Its buildings were on ground extending from Greene to Wooster streets, between 6th and 8th streets, then quite on the outskirts of the city. A few weeks before, the great fire of 1835 had greatly reduced the resources of its friends, and, not many months after, the financial troubles of 1837 spread bankruptcy among them and through the land simultaneously with the ecclesiastical troubles which rent asunder the Presbyterian church. Yet, after a little delay, the erection of the needful buildings was secured. Thomas McAuley, D.D., president; Henry White, D.D., professor of theology; and Edward Robinson, D.D., LL.D., professor of biblical literature, constituted the faculty, assisted by several professors and instructors extraordinary. The famous Van Ess library, opportunely offered for sale in Europe at a small fraction of its value, was bought as a nucleus. When the act of incorporation was obtained, the word "Union" was added to the name, in the legislature, for distinction's sake, but without having been desired by the directors. It has since proved an honorable distinction in a sense not then contemplated. The early history of the seminary was a continued struggle with inadequate financial resources; but by numerous and liberal subscriptions, in some instances several times repeated, and by legacies, it has gradually become well endowed. Its vested funds and other property amount now to about \$2,000,000. Its library has increased from 13,000

vols. to 71,000 vols. and 27,000 pamphlets. The location on University place was exchanged, 1884, for one on Park ave. and Murray hill, where fine buildings have been erected, including the Morgan library and the Adams chapel. During its first 40 years the institution sent forth 1778 students. Its faculty now consists of 7 professors and 5 instructors, and several courses of lectures are given on subjects by distinguished men specially appointed from time to time. The number of students for 1895-96 was 155.

UNION LABOR PARTY, a political party in the United States organized at a convention at Cincinnati on Feb. 22, 1887 and drawing its support largely from the Greenbackers, and the members of the older labor organizations and of the farmer organizations. The chief points in its platform during the campaign of 1888 were opposition to land monopoly in every form, a demand for national control of means of transportation and communication, a condemnation of a further issue of interest-bearing bonds and a demand for free coinage of silver, the abolition of national banks, the establishment of women's suffrage, the exclusion of the Chinese, the introduction of a graduated income tax, and the passage of a constitutional amendment making United States senators elective by direct vote of the people. In the election its vote was small, but the organization paved the way for the formation of the People's party.

UNIONTOWN, borough and co. seat of Fayette co., Pa.; on the Pennsylvania and the Baltimore and Ohio railroads; 70 miles s. by s.e. of Pittsburgh. It contains Mountain View park, electric light and street railroad plants, waterworks, national and state banks, about 15 churches, glassworks, iron and steel works, and flour and planing mills. It was laid out in 1783 and incorporated in 1796. Pop. '90, 6359.

UNION UNIVERSITY. See **UNION COLLEGE**.

UNIO PROLIUM is a phrase used in Germany to designate a form of adoption which frequently takes place when a widower having children marries a widow having children. The agreement between these parents is to the effect that these children of previous marriages shall have the same rights to their succession as any children which may be the fruits of their marriage.

UNIT is a magnitude or number regarded as an individual whole. A unit of weight or measure is a determined quantity or magnitude taken as a standard of comparison for others of the same kind. In Physics, the fundamental units are those of *length*, *mass*, and *time*, as all necessary measurements can be based on these quantities. In scientific measurements, the C. G. S. system (see J. D. Everett's *Units and Physical Constants*) suggested by the Unit Committee of the British Association, and generally accepted, adopts the *centimetre* as the unit of length, the *gramme* as the unit of mass, and the *second* as the unit of time. This system receives its name from the initial letters of these denominations. In the system of British weights and measures, based on Bird's standards, established in England during the years 1758 and 1760, and introduced later into the United States, the unit of length, the yard, is defined by the distance between two parallel lines on gold studs, sunk in a bar of bronze when at 62° Fahrenheit. This bar is preserved in the Standards Office, 7 Old Palace Yard, Westminster, London. The unit of weight, the pound, is defined by the attraction between the earth and the standard pound of platinum when in a vacuum at sea level at London; also preserved in the Standards Office. Platinum is used because capable of being exposed to pure air at an ordinary temperature for an indefinite length of time without increase or diminution of its mass. The unit of value in money in England is the *pound sterling*; in the United States, Mexico, and the Argentine Republic, the *dollar*; in Germany, the *mark*; in the Latin Union (q.v.), the *franc*; in the Scandinavian Union and Denmark, the *krone*; in Holland, the *guilder*; in Austria, the *guilder*. The unit of heat is the heat necessary to raise the temperature of one pound of ordinary cold water one degree Fahrenheit. The unit of power for a steam engine is the power required to raise 33,000 pounds of matter one foot in a minute, a horse power. In mechanics, the unit of work is the work expended in raising one pound of water to the height of one foot. The integral unit is 1, or the unit of integral numbers. The unit of a fraction is the unit to be divided into fractional parts. A fractional unit is one of the equal parts into which a unit is divided. Unit is the name of a small gold coin of the time of James I. of Scotland. The units adopted for electrical measurements are, the centimetre as the unit of length, the gramme as the unit of mass, and the mean solar second as the unit of time.

UNITARIANS, a name applied generally to all who maintain that God exists in one person only, and specially to a small Christian sect of recent times, whose distinguishing tenet is the unity as opposed to the trinity of the Godhead. In the more general sense, the name of course includes the Jews and the Mohammedans as well as those Christians who deny the doctrine of the trinity, and in this sense also there have been Unitarians from the earliest period of ecclesiastical history. Until the middle of the 2d c., there seems to have been no controversy upon the subject; but from that time to the end of the 3d c., there was a succession of eminent teachers who maintained, against the ecclesiastical doctrine of the Logos, the undivided unity—or, as they expressed it—the *monarchy* of God. From their use of this word, they are known in ecclesiastical history as the Monarchians. There are generally understood to have been two classes of them—those who taught that Christ was God in such a sense that it was the Father who became man, and was born and suffered, and who were, on this account, called by their opponents Patripassians; and secondly, those who held that

Christ was in nature a mere man, but exalted above all other prophets by the superior measure of divine wisdom with which he was endowed, and who therefore corresponded more nearly with the modern Unitarians. It is right to notice, however, that the doctrines of the Monarchians are known to us only through the statements of opponents, and it is probable they would have disowned the more extreme views ascribed to them. To the former of the two classes we have mentioned belonged Praxeas, against whom there is a treatise by Tertullian, and Noetus; and at a later period—about the middle of the 3d c.—the famous Sabellius taught very similar doctrines. The other class was represented by Theodotus, Artemon, and especially Paul of Samosata, bishop of Antioch, who was eventually deposed on account of his heresy. Beryllus, bishop of Bostra in Arabia, who is said to have been convinced of his error by Origen, would seem, from the single sentence which records his teaching, to have belonged to this class rather than the other. The Monarchians appealed in support of their doctrines to the Old and New Testaments, and to the early opinions of the church. They are said, by Tertullian, to have consisted of the simple and the unlearned—"always," he adds, "a majority of the faithful"—a statement which shows that they must have been tolerably numerous in his time; while a writer quoted by Eusebius brings against them the apparently opposite charge of being students of geometry and lovers of Aristotle.

The grand theological struggle which followed in the 4th c. between the Arians and the Athanasians may be regarded as but another phase of the Unitarian controversy, inasmuch as Arius held that the Son was a created being, and denied his consubstantiality with the Father. On this head, the reader may consult the articles **ARIUS** and **ATHANASIUS**. We now pass on to the post-reformation period.

It is not strange that in the great stir of thought which accompanied the reformation, some should have been found bold enough to question the grand Catholic doctrine of the trinity. Such there were even before the Socini. See **SOCINUS**. Among the earliest may be mentioned Hetzer and Bassen, both of whom were executed in 1529, the former, however, not exclusively for his religious opinions; Denck, Campanus, and the famous Spaniard, Michael Servetus (q.v.). So widely, indeed, was the Unitarian doctrine diffused that it was thought necessary, in the first article of the Augsburg confession, to condemn the modern Samosatans, who deny the personality of the Word and Spirit, declaring the former to be a proper spoken word, and the latter a divine influence; and as early as 1527, one Andr. Althamer published a work against "the modern Jews and Arians under a Christian name, who deny the deity of Christ." Under the influence of the elder Socinus, Unitarianism gained many adherents in Venetia. Poland and Transylvania, however, became its principal strongholds, and in those countries, favored by circumstances, it struck the deepest roots. In Poland, the nobility, protected from persecution by their class privileges, proved singularly favorable to a movement which seemed more destructive of the traditions of the Catholic church than any that had yet been entered upon; the Unitarian refugees from other countries found here a ready welcome; and in the reign of Sigismund II. (1548-72), this party of reformers was strong enough to form itself into a separate church. At a rather later period, Poland was the principal field of labor of the younger Socinus, and Unitarianism continued to flourish there until the middle of the 17th c., when, under John Casimir, who before his elevation to the throne had been a cardinal and a Jesuit, it was extirpated by force. In Transylvania, the Unitarians have succeeded in maintaining their existence, notwithstanding much opposition and persecution, from the reformation to the present day. The first who openly preached Unitarianism in that country were George Blandrata and Francis Davidis (1565), and under the influence of these distinguished men, large numbers, including the king himself, embraced the new opinions. But this period of prosperity was not of long duration. In 1572, though still permitted to worship according to their conscience, the Unitarians were forbidden to make any attempts at propaganda, or even to print their religious books. They were not, however, subjected to any violent persecution until after the incorporation of Transylvania with the Austrian empire, which took place in 1690; but after that time they were robbed by the Roman Catholics of all their churches and church property, forbidden to build new churches without the permission of the emperor, and by degrees excluded from all government offices, even the very lowest. On the accession of Joseph II., happier times returned. Their churches were forbidden to be seized, and an indemnity was even paid them for the loss of the cathedral church of Klausenburg. They were now enabled to build new churches, and their cathedral and college at Klausenburg are said to be still two of the finest buildings in that city. The Unitarians of Transylvania number about 60,000, and are said to be increasing. They have an organized system of church government, with a bishop at its head. They have three colleges—that of Klausenburg, with 12 professors and 273 students; that of Torda; and that of St. Keresztur.

In England, Unitarian opinions were somewhat later in making their appearance than on the continent. As early, indeed, as 1548, a priest named John Ashton was accused of Arianism, and escaped with his life only by recantation; and during the reigns of Edward VI., Mary, Elizabeth, and James I., a few suffered martyrdom on similar charges. But during the reign of James I., continental Socinianism began to exercise considerable influence in England, and continued to do so to the end of the century, so

much so that, in 1665, Dr. Owen wrote that "the evil is at the door, that there is not a city, a town, scarce a village, in England wherein some of this poison is not poured forth;" and how deeply the church of England was infected with it may be inferred from the no doubt exaggerated statement of Palmer, who, in 1705, spoke of "troops of Unitarian and Socinian writers, and not one dissenter is found among them." Many eminent men of the time, including Milton, Locke, and Newton, and in the next century, the famous apologist, Lardner, must be numbered among the Unitarians; but it was in the last decade of the 17th c. that the controversy on this subject was most active, and at this time were published the old Unitarian tracts—a series of anonymous writings marked by eminent learning and talent. Hitherto, however, the Unitarians, with the exception of the society formed in London by John Biddle (q.v.), which did not survive its founder, had no organized existence. But after the passing of the toleration act in 1689, whereby non-conformity was made legal, the way was prepared for that gradual change by which the orthodoxy of the English Presbyterians passed into Unitarianism. It was at this time that most of the old Presbyterian chapels were founded, and the trusts being open—i.e., not committed to any doctrinal system—ministers and people were left free to adopt and promulgate whatever new opinions should approve themselves to their conscience. Thus the Unitarians are the legitimate successors and representatives of the 2,000 Presbyterian divines who in 1662 left the church of England in consequence of their inability to comply conscientiously with the terms of the act of uniformity. The ground of this separation, it should be understood, was no difficulty about the doctrinal articles of the establishment. The English Presbyterians (so called from their preference for that form of church government, for they were never able to adopt it) were originally as orthodox as their Episcopal brethren; but having refused to commit themselves to any authoritative creed, they underwent a gradual change to Arian, and at length to Unitarian views. Many preached such views without exciting attention or controversy, and indeed, until 1813, the law which made it blasphemy to speak against the Trinity, though not strictly enforced, was still in existence. During the latter half of the 18th c., Dr. Priestley (q.v.) appeared as the champion of the humanitarian view of Christ's nature, and, by the influence of his writing, secured the more open advocacy of that doctrine. In 1773 Dr. Lindsey resigned his charge in the church of England, and became pastor of the Unitarian congregation of Essex street, London—an event which may be regarded as an epoch in the history of English Unitarianism. In 1813 the Unitarians were placed by law fully on a par with other dissenters, and since that time there has been no attempt at persecution, with the exception of the claim made to some of their properties by certain orthodox dissenters. This claim was met by the dissenters' chapels act in 1844. The Unitarians of England and Wales are purely congregational in their church government, their only organ for combined action being the British and foreign Unitarian association, which holds its meetings annually in London. Their principal place of education is Manchester New College, London, which is, however, an unsectarian institution. They have also a missionary college in Manchester, and the Presbyterian college, Caermarthen, educates Independent and Unitarian ministers. They have at present about 282 chapels and 20 mission stations.

In Scotland the religious atmosphere has never been very favorable to Unitarianism. It was in that country that the last execution for blasphemy against the Trinity took place in the person of the unfortunate Aikenhead. Nevertheless, toward the close of the 18th c., there was a certain amount of Arianism among the moderates in the Church of Scotland. Unitarianism, as a distinct system, was preached at Montrose as early as 1783; and, at the beginning of the present century, some attempts were made to diffuse it by means of missionary efforts. There are now ten congregations in the country. That at Edinburgh was originally a branch from the Cameronians, the strictest of Calvinists, but having adopted the principle of free inquiry, they gradually embraced Arian, and eventually humanitarian views. This last change took place during the ministry of the late Dr. Southwood Smith, about the year 1812.

In Ireland the history of Unitarianism is intimately connected with that of Presbyterianism. It flourishes principally in the n. of the island, where there is a strong infusion of Scotch blood, and where Roman Catholicism has the least influence. In 1891 there were forty churches in Ireland. The Unitarians of Ireland are Presbyterians in fact as well as in name.

The Unitarians first appeared, organically, in the United States in King's Chapel (now "Stone Chapel"), Boston, the first Episcopal church established in New England—where Mr. James Freeman, having been appointed a "lay reader" avowed Unitarian sentiments, inducing the congregation to declare themselves independent, alter the liturgy (1785), and ordain him, by the action of their wardens and vestry, as their pastor (1787). He ministered to them about fifty years. During this time other ministers, some of them in Harvard college, embraced and preached different shades of the same views, until in 1812 a controversy on the subject arose, between Dr. Worcester and Professor Stuart on the one side, and Dr. Channing and Prof. Ware on the other. This produced a crisis among the churches of Boston and the vicinity that had remained nominally evangelical; many of them were rent asunder, and congregations avowedly Unitarian were formed. The American Unitarian association, organized in Boston, 1825, was designed principally to publish and circulate tracts and books. It has also given aid in

building churches and sustaining preachers in this country, and has maintained a missionary in India in communication with the Brama Somaj and its thousand congregations. The first general gathering of American Unitarian ministers was at New York in 1865, where the question of adopting a creed was debated, but met with very little favor. Except the single tenet which their name indicates, there is little in which they are agreed. While some of their churches and ministers are divided from the evangelical by a scarcely visible line, others stand at the extreme of rationalism and naturalism. Their history, they say, is "a history of individual opinions rather than of organizations, or methods of action; it is biographical, not national; it takes the form of heresies, as they are called, rather than creeds; it is marked by protests rather than professions. It has been called by its opponents a system of negations; yet every negation implies an affirmation. The affirmations of the conference were that every man has a right to judge for himself, unbound by any set of articles; that while professing itself to be a Christian body, it left every one to decide for himself what Christianity is, i.e. to choose among the conflicting views of Christian doctrine and statement that which seemed to him to be true and right." "The stand taken by Unitarians," they say, "is for nature, for human nature, for everything that God has made, as being the manifestation of his will as truly as anything written in the Bible. Righteousness and not dogma is the everlasting condition of all welfare in this world and the next; the acceptance of Christianity is not the believing in a creed, but believing with the heart; Jesus Christ, himself, in his life and death, all dogmatizing apart, is the embodiment of his religion; he holds that supremacy in the beauty and power of his life which makes it of all that has appeared upon earth, the fittest to be imitated and followed; and the man who comes nearest to that is the best Christian." According to the statistical returns for 1896 there were 525 ministers, 458 churches, and 70,000 communicants. The divinity school at Harvard university and the theological seminary at Meadville, Pa., are connected with this denomination. The denomination has much literary culture and wealth; it is socially select, but shows no such rapid growth as characterizes several of the evangelical denominations. This is due doubtless to its continual attitude of negation and protest.

The Socinians assumed, as the fundamental principle of their theology, the sufficiency of Scripture, or rather of the New Testament, which, they held, had, for all matters of faith, superseded the Old. According to their system, Christ was a true man, but conceived of the Holy Spirit; and on account of the divine power which he has received from the Father, and his exaltation as head over all things, he is to have worship offered to him. The Holy Spirit is not a person, but a divine influence. The Socinians rejected also the doctrine of original sin. Man, they taught, was created with a mortal nature, but by the special gift of God, was endowed with a conditional immortality. He was created innocent, but not positively righteous. The gift of immortality he forfeited by disobedience. The fall of Adam, however, being a single act, could not deprave his own nature, much less that of his posterity; and in the latter, death was not a consequence of the fall, but was simply the condition of birth and life. Thus, the actual consequence of Adam's fall was not any radical corruption of human nature, whereby it was impossible for man to do any good thing, but rather a moral deterioration, producing, with repeated acts of disobedience, an increasing tendency to sin. Man, after the fall, retained his free will, and the power of abstaining from sin if he so pleased. On the question of the merits of Christ, the Socinian doctrine was essentially different from that of all the other Protestant sects. Christ's merits did not consist principally in his death, but in his life, his teachings, and his example. Nor was his death regarded as an atoning sacrifice, or as having any vicarious efficacy whatever, but simply as a confirmation of God's will, and the seal of the new covenant. Christ died for our sins—first, that all sinners might in this way have the assurance of forgiveness and of eternal life; secondly, that they might be drawn to Christ, and led to seek through him alone remission of their sins; and thirdly, that God might thus testify his boundless love to the human race, and might reconcile it to himself. But the crucifixion was important chiefly as preparing the way for the great crowning miracle of the resurrection. Here, in fact, not Christ's death, but his resurrection, is the central point of the Christian scheme. By this he confirmed his doctrine of immortality, and prepared for his ascension into heaven, where he now fills the office of our great high priest. Jesus "frees us from the punishment due to our sins, in that he continually protects us by the virtue and power which he has received from the Father, and by his intervention, defends us, as it were, from the wrath of God; and he frees us from servitude to our sins, by drawing us away from every kind of vice, and showing us in his own person the reward of him who abstains from sin." Predestination in this system means the decree of God, made before the foundation of the world, that they who believed and were obedient should be saved, and that they who believed not and were disobedient should be damned. Justification takes place when God pardons our sins and gives us eternal life. The Socinians regarded the sacraments as simply external signs testifying to Christian faith. Hence they held infant baptism to be irrational as well as unscriptural, but thought that a custom so old and established should be tolerated.

It need scarcely be said that the systematic theology of the early Socinians is in Great Britain quite a thing of the past; indeed, the English Unitarians, though undoubtedly

more or less influenced by their continental brethren of the reformation period, have with the latter no very direct historical connection. They seem rather to have arrived at independent conclusions, through their "rational" interpretation of Scripture, and their consistent rejection of human authority in matters of faith. The Unitarians of the present day, like almost all Christian sects, must be divided into two classes—a conservative and a progressive class—or, as they are often called, an old and a new school. The former adopt the old rule of the sufficiency of Scripture, though with many such qualifications as the scientific criticism of the Bible has rendered indispensable. The most conservative Unitarians, for example, would not contend for the literal truth of the first chapter of Genesis, nor for the doctrine of verbal inspiration in any shape. The Bible is *not*, but it *contains*, the Word of God, is the form which best expresses their position on this subject. They generally hold the simple humanity of Christ, and even reject the supernatural birth, thinking the parts of the gospels which record that event to be less authentic than the parts referring to the ministry, the death, and resurrection of Jesus. To the death of Christ they ascribe much the same kind of efficacy as we have seen was ascribed to it by the Socinians, regarding his teaching and example as the most essential part of his work, and his death as an attestation to the truth of his mission, and a preliminary to his resurrection. What, however, chiefly distinguishes the Unitarians of this school from those of the new or progressive school, is the place which they give to the miracles as supernatural sanctions of the truth of Christianity. In this respect they must be considered as still under the influence of Locke's philosophy and the theology of Dr. Priestley. Denying that man has any immediate knowledge or intuition of spiritual things, they regard Christianity as a system of moral and religious truth external to man's nature, and requiring, in proof of its divine origin, certain evidence beyond its inherent credibility and adaptation to human wants. This evidence they find in the miracles, which they accept as well-attested facts, on the same ground on which all historical facts are accepted. "If there be any truth in history," says Dr. Priestley, whose influence can still be traced in the Unitarians of this school, "Christ wrought unquestionable miracles, as a proof of his mission from God; he preached the great doctrine of the resurrection from the dead; he raised several persons from a state of death; and, what was more, he himself died and rose again in confirmation of his doctrine. The belief of these facts I call the belief of Christianity." According to this view, therefore, Christ is an ambassador from heaven to earth; the miracles he wrought are his credentials; and the moral and religious truths which he taught are his message. It is not indeed denied that many or all of those truths might be learned from the light of nature, but they have received from Christianity a sanction which gives them a greater degree of certainty than they could otherwise possess. The Unitarians of the progressive school, on the other hand, have abandoned the philosophy of Locke for more spiritual modes of thought. So far from regarding man as entirely dependent upon his reasoning powers for his knowledge of religion, they rather look upon him as standing in a living relationship with the one infinite source of all truth, and as having within his own nature the germs of the highest religious faith. Christianity, accordingly, they regard not as a *message* or a system of truth communicated and authenticated from without, but as the highest expression of the divine in humanity—an expression not necessarily preternatural, but connected with the previous history of mankind by the natural laws of moral and spiritual development. To this view of Christianity, the miracles are not felt to be essential as proofs; and the truths of the gospel are thought to be quite unaffected by any judgment regarding them. The Unitarians, however, of this school, while, from their point of view, they regard the question of the miraculous as one of critical rather than religious interest, yet generally accept the miracles as historical facts, considering that there is sufficient evidence to prove that they took place. A few, but an increasing number, agree with Theodore Parker and many of the German critics in rejecting them, on the twofold ground that they are intrinsically incredible, and that the evidence for them is conflicting and uncertain. Generally speaking, the Unitarians of this school, like the so-called Broad-church men, are disposed to regard with favor the freest criticism of the Bible. Holding that inspiration is a quality which is not peculiar to the Bible, but common to all the most elevated religious literature, and that it in no case implies immunity from error, they maintain that the Scriptures must be subjected to the same rules of criticism and interpretation as any other book, and that each book of Scripture is to be studied not as a collection of infallible oracles, but as a record of the mind of the age in which it was produced. In this light, however, and also as a record of the grandest religious movements of the world's history, they hold the Bible in the highest estimation. Such is a statement, necessarily imperfect, of the peculiarities of the two Unitarian schools in their extremest divergence from one another; it need scarcely be added that in fact they merge into each other by imperceptible gradations.

It will, of course, be understood that the Unitarians of all shades of opinion are agreed in rejecting the entire orthodox scheme—including the doctrines of the Trinity, the vicarious atonement, the deity of Christ, original sin, and everlasting punishment—as both unscriptural and irrational. They celebrate the Lord's supper in their churches, not as a sacrament, but as a service commemorative of Christ's death, and expressive of

spiritual communion with him. They also adhere generally to the rite of infant baptism, though there are a few Unitarian Baptist churches. In recent years, the Unitarians have given renewed prominence to the principles of comprehension and of free inquiry apart from the restraints of theological creeds, conceiving that in this they are conforming to the spirit of their Presbyterian forefathers; and many even object to the name Unitarian, as one which might be held to imply a doctrinal bond of union, and to be, to that extent, inconsistent with the fundamental principles of the body, which both now and in former times have always included unrestricted freedom of religious thought. It is impossible here to explain at greater length the Unitarian position; but it may be mentioned, as an important fact, that, when, at the meeting of the British and foreign Unitarian association in 1866, it was proposed to add to the rules a clause defining "Unitarian Christianity," the motion was almost unanimously rejected. The motion was intended as a protest against anti-supernaturalism. Its rejection, on the other hand, was an assertion of the principle of comprehension and freedom, and was voted for by those who sympathized doctrinally with the proposer, as well as by those who differed from him. For fuller information on the history and doctrines of the Unitarians, the reader may consult Dr. Beard's *Unitarianism in its Actual Condition*; the Rev. J. J. Tayler's *Religious Life of England*; Otto Fock's *Socinianismus*; and Lange's *Geschichte und Lehrbegriff der Unitarier vor der Nicänischen Synode*.

UNITED ARME'NIANS, that division of Armenian Christians who are under the ecclesiastical jurisdiction of the pope. The Armenian rite in the Roman Catholic church has a patriarch and primate in Cilicia, 4 archbishops at Constantinople, Aleppo, Diarbekr, and Lomberg, 2 in *partibus*, and 16 bishops. Their union was effected, 1314-44. They number 100,000, of whom 78,000 are in Turkey and Persia; more than 8000 in Austro-Hungary; and 14,000 in Russian Caucasasia and Siberia. In 1872 a part of the United Armenians of Turkey renounced the jurisdiction of the pope and joined the Old Catholics.

UNITED BRETHREN IN CHRIST, a church formed in 1760 among the Germans in Pennsylvania, by Philip William Otterbein, sent to America by the synod of Holland as a missionary. This church has often been confounded with the Moravians, with whom, however, it has no ecclesiastical connection. Otterbein commenced his labors at Lancaster, Penn., but removed to other places, and finally to Baltimore. He was a man of fervent piety, a remarkably effective preacher, and had great influence with the people. He held union-meetings, often in the woods, which were continued for several days. To one of these he invited all who had experienced a change of heart. Many came, among whom were Lutherans, Reformers, Mennonites, Moravians, and others. A Mennonite preacher—Martin Boehm—professing to have experienced what he called the new life, was present, and preached with great power. At the close of his sermon Mr. Otterbein embraced him, and said: "We are brethren." This was the origin of their name. These two labored together for 50 years, and as their converts multiplied and needed ministers, laymen were licensed to preach, and soon annual conferences were appointed for examining, licensing, and directing them in their work. The first annual conference was in 1800 at Baltimore; the first general conference, 1815. In 1889, 6 bishops, 4450 churches, 2050 ministers, 204,517 members, were reported. This church has 12 educational institutions in several western states. It has at Dayton, Ohio, a large printing establishment, which issues a number of periodicals and a variety of books in German and English. It has quarterly, annual, and general conferences, of which the latter is the highest, and meets quadrennially. Lay-delegates have been members since 1873. Bishops are elected for four years. No slave-holder, or member of secret society, or any one who manufactures, sells, or drinks intoxicating liquor is admitted to the church. Baptism is administered in the mode which the candidate prefers. Infant baptism is practised. The theology of the United Brethren is Arminian. Their service, formerly in German only, is now also in English. They have foreign missions in Germany and Africa.

UNITED COPTS are those Christian descendants of the ancient Egyptians in Egypt and Abyssinia, who, since 1732, have been united to the Roman Catholic church. See *Copts*.

UNITED EVANGELICAL CHURCH, established in Germany, 1817, by the union of portions of the Lutheran and Reformed Churches. Such a union had been attempted without success in 1529, 1631, 1661, and by Frederick I. of Prussia, 1703-22. Frederick William I. published several decrees having the same object in view. It was favored also toward the end of the 18th c. by the progress of rationalism, which made many theologians of both churches indifferent concerning doctrinal controversies, because they had lost faith in the doctrines themselves. Schleiermacher proposed to establish an outward church-unity, leaving disputed points in scientific theology still open for discussion. At the tercentenary of the reformation in 1817 a visible union was established, limited, however, at first, as many of its advocates supposed, to a common church government, and a common celebration of the Lord's-supper. In this movement the government of Prussia has always been the leader. The clergy in Berlin having published a declaration in favor of it, the minister of the interior confirmed it, and issued a decree that the organization should be called the Evangelical Christian church. The Lord's-supper was to be celebrated by adhering strictly to the scriptural words of institution. The progress

of the union was disturbed by the king's recommending the court liturgy to all the congregations of the kingdom; and when, in 1834, the royal decree ordered its introduction into all congregations—united and non-united—many strict Lutherans left the united church. During the rest of that reign the government endeavored to force them back, but Frederick William IV. having, in 1845, granted liberty of worship, they organized an independent Lutheran church; the rest of the old Lutheran, and the Reformed Church, including about 10,000,000 persons, being nominally connected with the United Evangelical Church. One party of these regarded the union as only an external subjection to a common church government, while in doctrine the churches might be Lutheran, Reformed, or United; a second party, comprising the chief theological faculties, built its doctrines on the Bible, together with the dogmas common to the Lutheran and Reformed symbols; and a third, rejecting the authority, both of the Lutheran and Reformed symbols, and professing to hold simply to the Bible, claimed the right of subjecting even its authenticity to critical inquiry. In 1846 the king convoked a general synod to complete the organization of the church; and the work, having been interrupted by the revolution of 1848, was resumed in 1856. A similar union of Lutherans with the Reformed has been accomplished in several other of the German states; while of the rest some are too exclusively Lutheran, and some too exclusively Reformed to warrant the attempt. In 1885 the United Evangelical Church of all Germany had 25,000,000 members. A branch of this church was organized in the United States at St. Louis in 1840, and, after several divisions and reunions, now includes 7 synods, having about 300 ministers and 40,000 members. As late as 1876 the German language was exclusively used in all its congregations.

UNITED GREEKS. See GREEK CHURCH.

UNITED METHODIST FREE CHURCH, a branch of the Methodists in England, was formed at Rochdale in 1857, by the union of two divisions of the denomination, whose history is as follows: The introduction, in 1827, of an organ into Brunswick Chapel at Leeds, led to the withdrawal of a portion of the congregation, and the organization of the Protestant Methodist Church. In 1836 this body united with the Wesleyan Methodist Association, which had been formed in that same year, and owed its origin to dissatisfaction with the efforts of the Methodist Conference to establish a theological seminary. In 1849, the expulsion from the Conference of three ministers, who had, it was claimed, been insubordinate, gave rise to the Wesleyan Reform Union. Attempts to secure the return of the expelled clergymen and their adherents, led to what was termed the "Mediation Movement," in which the memorialists, all within the Methodist Connection, asked for some sort of lay representation in the chief courts. This being denied, the agitators, who did not wish to establish a separate body, sought admission to the Conference of the New Connection, and failing in this were induced to confer with the Wesleyan Methodist Association, and in 1857 a union of the two bodies was formed, which took the name of the United Methodist Free Churches. By 1860 only a few societies were left to constitute the Reform Union, which in 1889 had only 14 ministers and about 8600 members. This branch of the English Methodist Church, which is the third in numerical importance, is represented in Scotland, and in its missionary stations in Jamaica, Australia, New Zealand, Eastern Africa, and China. In 1896 this body had 417 ministers, 3448 local preachers, 89,618 members, and 1350 Sunday schools, with 25,296 officers and 203,712 members.

The independence of the local church, and the free election of members to the annual assembly, constitute the most prominent features of this organization. Committees annually chosen have charge of the funds, institutions, and general work.

UNITED PRESBYTERIAN CHURCH, the name of a religious body in Scotland, which was constituted in 1847 by the amalgamation of the SECESSION and RELIEF CHURCHES, whose origin and history we propose briefly to narrate.

The SECESSION CHURCH.—The causes which led to the formation of the secession church, in order to be thoroughly understood, would require to be unfolded at much greater length than our space permits. But some notice of them, however brief, is absolutely necessary. It is well known that the reformation from popery in Scotland was a very radical and decisive affair in regard to both the doctrine and government of the church. The people became strongly Calvinistic and Presbyterian; and after the accession of James to the English throne (1603), their attachment to their ecclesiastical system became stronger still. The efforts of that monarch to supplant it by Episcopacy proved unavailing, so far as the great body of the commons and gentry were concerned; but moved by various considerations, into which religious conviction entered only as a very subordinate element, many of the Scottish nobles adopted the church principles of their sovereign, and after the restoration (1660), supported the governments of Charles and James in their persecution of the covenanters. See COVENANTS; SCOTLAND; SCOTLAND, CHURCH OF. At the meeting of the Scottish estates in 1690, Episcopacy, which in Scotland had obtained a temporary supremacy under the rule of Sharp (q.v.) and Lauderdale, and had, besides, become synonymous with adherence to the house of Stuart, was abolished, and Presbyterianism re-established. One unavoidable consequence of this was the abolition of the *right of patronage*, for in a multitude, probably the great majority of cases, the exercise of this right would have placed the nomination to ecclesi-

astical benefices in the hands of Episcopalian landholders, and thereby imperiled the existence of a sound Presbyterian ministry. But although there were still many zealous Presbyterians in Scotland, especially among the peasantry, the spirit of the nation as a whole had gradually undergone a great, and, in the opinion of some, a disastrous change, so far as religion was concerned. A kind of torpor seized the upper and middle classes after the "glorious revolution," and, earnestness growing unfashionable, was sneered at as fanaticism. A proof of the latitudinarianism of the times is the fact that some hundreds of Episcopalian curates were allowed to retain the parishes in which they had been arbitrarily stationed, on subscribing the *confession of faith*; and great numbers of laymen became elders in a church whose strict adherents they had themselves but recently hunted even to death. This obtrusion into the church of curates whom bishop Burnet describes as "the worst preachers I ever heard, ignorant to a reproach, and many of them openly vicious," produced, as may easily be conceived, a pernicious influence on the purity of ecclesiastical discipline; and in 1712, when the obnoxious *law of patronage* was restored, the triumph of the "court" or "moderate" party in the church may be regarded as complete. See MARROW CONTROVERSY. Violent settlements, effected by the agency of dragoons, now became frequent, and greatly irritated the people, whose petitions and appeals were almost invariably disregarded; and finally, in 1730, the assembly enacted that in future no reasons of dissent "against the determinations of church judicatures" should be entered on record. This attempt to gag the mouths of congregations was more than some could bear, and in Oct., 1732, the Rev. Ebenezer Erskine of Stirling, in a sermon delivered in his capacity of moderator before the synod of Stirling and Perth, denounced in solemn and impassioned words the recent legislation and spirit of the church. A committee was immediately appointed to consider the matter, and reported rather vaguely but unfavorably at the ensuing meeting of synod; in consequence of which Mr. Erskine, after three days' "warm reasonings," was found deserving of censure by a majority of six. He immediately protested (as did also twelve other ministers and two elders), and appealed to the next general assembly, which sustained the decision of the synod, and ordered the rebuke and admonition to be administered "in order to terminate the process." Erskine, of course, had to submit to censure, but left a written protest on the table of the assembly, in which he declared his intention to continue testifying against the "defections" of the time. This protest was also signed by William Wilson, minister of Perth; Alexander Moncrieff, minister of Abernethy; and James Fisher, minister of Kinclaven. The assembly was indignant, and next day ordained "that the four brethren appear before the commission in August next, to express sorrow for their conduct, and retract their protest;" on pain of being suspended from their ministry. This they refused to do, and in consequence were declared "no longer ministers of the church" (Nov., 1733), whereupon they handed in a final written protest, in which, after referring to the "defections from our reformed and covenanted principles" of the "prevailing party," they protested that they were obliged to MAKE A SECESSION FROM THEM, and appealed unto the first free, faithful, and reforming general assembly of the church of Scotland.

This was the origin of the famous "Secession Church," which has made so deep an impress on the religious life of Scotland. At first composed of only four ministers, it rapidly began to gather strength. Little Christian societies were everywhere formed, which were gradually supplied with pastors either from the establishment, or from pious youths trained to the work of the ministry by Erskine and his friends. Erskine and his friends drew up a statement of their reasons for separation, which was published under the title of *A Testimony to the Doctrine, Worship, Government, and Discipline of the Church of Scotland, or Reasons (by the Four Brethren) for their Protestation entered before the Commission of the General Assembly*. This document, which afterward came to be known as the "First or Extra-judicial Testimony," presented in a polemical or argumentative form those facts in the later history of the church of Scotland at which we have already glanced; and is of great value with reference to a proper understanding of the grounds of secession. From it we learn that it was *not* one thing only, not even the unpopular "law of patronage" (as has sometimes been carelessly imagined and asserted), that induced Erskine and his friends to leave the church of their fathers; but an accumulation of grievances that in their eyes had become insupportable. In short, the Secession church had a *religious*, and not a *political* origin. What the "four brethren" sought was the vindication of what they held to be evangelical truth, much more than of the mere right of "popular election." So much popular indignation was excited by the deposition of the "four brethren," that it was thought desirable by the majority of the "Moderate party" to make certain concessions to the "Evangelicals," or "Marrow party," lest the spirit of insurrection should grow, and perhaps overturn the establishment. Accordingly, the general assembly of 1734 passed some measures distinctly favorable to the latter party, and curiously contrasting with their former procedure; and finally, on the last day of the sittings, empowered the "synod of Perth and Stirling" to remove the censures from the four brethren, and to restore them to their respective charges. This was done; and to show how far their new-born cordiality could go, the synod proceeded, in Mr. Erskine's absence, to elect him "moderator;" but Mr. Erskine declined to be "reponed," and gave his reasons in a letter to the Stirling presbytery, and in a pamphlet subsequently published. In Dec., 1736, appeared the pamphlet entitled *An*

Act, Declaration, and Testimony for the Doctrine, Worship, Discipline, and Government of the Church of Scotland, commonly known as the "Judicial Testimony," which is a sort of survey of the whole ecclesiastical history of Scotland from the reformation downward, in which all the "instances of defection and relapse are marked and judicially condemned." In 1737 the Rev. Thomas Mair of Orwell, the Rev. Ralph Erskine of Dunfermline, the Rev. Thomas Nairn of Abbotshall, and the Rev. James Thomson of Burntisland, joined the original "four." The church authorities, filled with anger and alarm, now resolved to proceed to extremities against the seceders. In 1738 the "commission," obeying the injunctions of the assembly of that year, libeled the "Eight Brethren," and summoned them to appear before the assembly of 1739, which they did—having, however, first drawn up and passed an act entitled a *Declinature*, in which they disclaimed the authority of the established courts. One final effort was made by the assembly to bring them back to the bosom of the church, but it failed—the "brethren" adhering strictly to all their former protestations and testimonies; and after a "year of grace," the general assembly of 1740 solemnly pronounced their deposition, and the connection between Erskine and the church of his fathers was forever at an end.

It is not necessary to describe minutely the gradual extension of the "Secession movement" among the people of Scotland, but we may mention, that in spite of the frequent refusal of sites for churches, and other modes of persecution, the cause abundantly prospered; and after a few years, the "Secession Church" came to be recognized as a really important body, both from the number of its congregations, and the grave, serious, and solid character of its members.

In 1747 a rupture or "breach" took place in the new body on the question of the burghs-oath, some affirming that this oath could not be taken by any consistent seceder, and others insisting that it could, and that the question regarding it ought to be matter of mutual forbearance. The party condemning the religious clause in the burghs-oath formed the *General Associate Synod*, or popularly, the *Anti-burgher Synod*; the party tolerating it, the *Associate or Burgher Synod*. Subsequently, a second split occurred in each of these, and two other trivial denominations were formed, the one assuming the designation of the *Constitutional Associate Presbytery*, or *Old Light Anti-burghers* (1806); and the other, the designation of the *Original Burgher Presbytery*, or *Old Light Burghers* (1799). After holding aloof from each other for more than 70 years, the Burghers and Anti-Burghers began to approximate once more, and finally, on Sept. 8, 1820, in Bristo street meeting-house, Edinburgh, the synods of the two long separated branches of the Secession were solemnly reunited. At the date of the "breach" (1747), the number of Secession congregations was 32; when the reunion took place, it had increased to 262. Henceforward, the history of the Secession church exhibits a course of uninterrupted prosperity. A certain change, however, now begins to show itself in the character and spirit of the denomination. Hitherto, seceders had worn a sort of *old-world look*, if we may use these words respectfully; their thoughts and interests in matters ecclesiastical centered round bygone times and events; their very language, like their sentiments, was archaic, and fell coldly upon all but the devoutest ears. Now, however, the wants of the modern world made themselves felt even in the narrow circles of Scotch dissent. In a word, they came under the liberalizing influences of the new-born enthusiasm for foreign missions, and started "stations" in Canada, Jamaica, Trinidad, Calabar, etc. So vigorously was this important branch of Christian work carried on, that in 1847, at the period of the union of the Secession and Relief churches, the former was found to be supporting a staff of more than 60 missionaries in different parts of the world. Further, the *Secession* church began to assume an attitude more distinctly antagonistic to the establishment. Though it has never formally avowed the *voluntary* principle (see VOLUNTARIYISM), yet the fact that it has maintained itself *ab initio* by voluntary effort, has had the effect of determining the great majority of the pastors and people to adopt this principle. A variety of circumstances, partly political and partly ecclesiastical, led to a great controversy between leading divines of the Establishment and of the Secession, known as the *Voluntary Controversy* (1829-34), which served to strengthen the voluntarism of the seceders, and brought them more closely into connection with the Relief church (see below), whose theoretical voluntarism was perhaps still more pronounced. Next followed the famous *Atonement Controversy*, in which the Secession church signalized itself by an adherence to the liberal evangelical theology of the Marrow, and on this vital point also it had the sympathy and support of the Relief body. The desire for union between the two denominations now became stronger than ever. Committees were appointed, and conferences held; and at length on May 13, 1847, in Tanfield hall, Edinburgh, the union of the Secession and Relief was formally accomplished, and the two churches, abandoning the names by which they had hitherto been known, formed themselves into one body under the designation of the UNITED PRESBYTERIAN CHURCH.

We now revert to the RELIEF CHURCH, whose history and fortunes we shall briefly narrate. After the expulsion of Erskine and his friends from the church of Scotland, the assemblies (packed with "court of sessions elders") became more determinedly "moderate" than ever. The split that occurred among the seceders in 1747 convinced them that they had now little to fear from the aggressive zeal of their opponents, who had taken to quarreling among themselves; and, desiring to stand well with government

for various reasons, they boldly resolved to deprive the people of all right to elect, or in any way to interfere with the election of ministers. Never were forced settlements more shameless than about this period; but it has been well remarked, "there is a point at which oppression becomes intolerable; and to a religious people, no oppression is half so galling as that which is spiritual." *Relief* was felt to be a necessity, and relief came in the person of the Rev. Thomas Gillespie, minister of the parish of Carnock, near Dunfermline. The circumstances which brought him into collision with the general assembly were these: In 1749, the Rev. Andrew Richardson was presented to the parish of Inverkeithing by the patron, Capt. Philip Anstruther; but the presentation proved so extremely unpopular that the presbytery of Dunfermline refused to proceed with it. In 1750, the case came before that high-handed body, the "commission of the assembly," who ordered the presbytery to proceed at once to induct Mr. Richardson. This mandate they firmly refused to obey; and when, after much discussion, the affair again came before the commission in March, 1752, it was resolved to transfer the onus of the unpopular settlement from the shoulders of the presbytery of Dunfermline to those of the synod of Fife. This compromise did not satisfy the out-and-out moderates in the church of Scotland. It was, therefore, resolved to make an example of the presbytery of Dunfermline at the ensuing assembly. On May 18, the "Inverkeithing case" came on, and after a brief but animated debate, the conduct of the "commission" was condemned by the assembly without coming to a vote; the presbytery of Dunfermline was ordered to induct Mr. Richardson on Thursday the 21st, and on the day following to appear at the bar of the assembly. The presbytery did *not* meet on Thursday—at least a *quorum* did not—and Mr. Richardson was consequently not inducted. On Friday, six ministers of the presbytery—Robert Stark, David Hunter, Thomas Gillespie, Alexander Daling, Thomas Fernie, and John Spence—handed in a "representation," explaining why they could not obey the commands of the supreme court. They were warned by the moderator of the danger in which they stood, and were finally informed that if they remained obdurate, *one* of them should be deposed. Next day, they were called *singly*. Stark, Fernie, and Hunter all wavered and shifted their ground a little; Daling and Spence said nothing; but Gillespie was ready with a second "representation." This was enough. Gillespie was fixed on as the most suitable sacrifice, and almost without trial, without a libel or any formal process whatever, he was arraigned, cast, condemned, and deposed. The majority of the general assembly, corrupt as its composition undoubtedly was, seems to have shrunk from active participation in the deed. Out of 158 members present, only 56 ventured to vote, and these, it must be remarked, were mainly lawyers!

The *Relief Church*, it will be seen, was founded simply on an assertion of the right of congregations to elect their own ministers. In 1758, Mr. Thomas Boston, jr., minister of Jedburgh, and son of the great Boston, threw in his lot with Gillespie; in 1761, the congregation of Colinsburgh, in Fife, did the same. The relief had now got a footing; and steadily increased. "Societies" (as in the case of the seceders) sprung up everywhere, which were gradually formed into congregations, and obtained ministers from the Establishment, the Secession, the Reformed Presbytery, and the English Presbyterians; nevertheless, they had long to sustain a severe fire of attack from the Seceders and Reformed Presbyterians, on account of their firm adherence to the latitudinarian principle of "free communion," i.e., of holding Christian fellowship at the Lord's table with other denominations. It is unnecessary to prosecute the history of the Relief further than to state that at the union in 1847 it numbered 113 congregations, while the Secession numbered 384 congregations; so that the UNITED PRESBYTERIAN CHURCH commenced with 497 churches, and a membership estimated at more than 140,000.

UNITED PRESBYTERIAN CHURCH.—The career of this church as a corporate body has been one of uninterrupted prosperity, and scarcely more is necessary than to indicate its present attitude and condition. In point of doctrine, it adheres (like all the other Presbyterian churches of Scotland) to the Westminster confession of faith and the larger and shorter catechisms, "it being always understood that we do not approve of anything in these documents which teaches, or may be supposed to teach, compulsory, or persecuting and intolerant principles in religion"—a qualification supposed to refer more particularly to the 23d chapter of the confession of faith. Its form of church government is Presbyterian; but, unlike the Established and Free churches, it has no intermediate courts between presbyteries and the supreme court, the latter of which it does not call a general assembly, but only a synod; though, in point of fact, it partakes more of the nature of a "general" assembly than the bodies known by that name, since it is really an assembly of the whole clergy of the denomination, with one elder from each kirk-session. It has a theological hall and library in Edinburgh, and a staff of professors. The United Presbyterian church is also at present, not only in *practice*, but also in *theory*, a voluntary church. The voluntary principle, it is true, is not formally laid down in any portion of her standards, or "basis of union;" but a long experience of practical voluntarism has finally led, one may almost say, the whole body of United Presbyterians to the conviction that the interests of Christianity are best served by the total separation of the church from the state. Although inferior in point of wealth to the Established and Free churches, the United Presbyterian church has honorably distinguished itself by its general liberality and occasional munificence.

In the year 1875 about 100 congregations of the United Presbyterian church situated in England were transferred by the mother church in Scotland to the "Presbyterian church in England" (q.v.). Since the separation of its English branch the United Presbyterian church counted, 1896, 577 congregations and 191,881 members. Protracted negotiations for union between the United Presbyterian and Free churches have been without result.

UNITED PRESBYTERIAN CHURCH OF NORTH AMERICA, was formed, 1858, by the union of the Associate and Associate Reformed churches.

I. *The Associate church* in the United States had its origin in the persecutions which drove parties of Scotch and Irish covenanters to the American colonies. In 1680 some of them settled at Port Royal, S. C., but were driven away by Spanish invaders. In 1750 the first minister of the Secession church of Scotland arrived in Philadelphia, and the Associate presbytery of Pennsylvania was formed. It soon had congregations in New York, Virginia, and the Carolinas. In 1776 the presbytery of New York was formed. In 1782 these presbyteries united with the Reformed presbytery in forming the Associate Reformed synod of North America. A small minority in both denominations were opposed to the union, and in them the Covenanter or Reformed and the Associate churches have been continued. The latter was increased by ministers from Scotland. In 1793 its first theological school was established in Beaver co., Penn. In 1798 the presbytery of Kentucky was formed, and the Associate synod of North America in 1801. In 1800 the presbytery of Pennsylvania declared slavery to be a moral evil, and unjustifiable; and in 1831 the synod excluded all slave-holders from its communion. This action led to the withdrawal of all the congregations in the southern states, but the loss was made up by accessions in western states. In 1858 the Associate synod included 21 presbyteries, 231 ministers, 293 congregations, and 23,500 communicants.

II. *The Associate Reformed church.* The Associate Reformed synod, formed 1782, organized itself in 1802 into a general synod, composed of the synods of New York, Pennsylvania, Scioto, and the Carolinas. In 1804 a theological seminary was established in New York city, with Dr. John M. Mason as prof. of theology. In 1820 the synod of Scioto withdrew from the general synod, and that of the Carolinas at its own request was set off as an independent body. In 1821 a union was formed with the general assembly of the Presbyterian church, but only a part of the denomination agreed to it. The synod of New York continued its separate existence, and in 1829 re-established the theological seminary at Newburgh. In 1855 it was united with the western synod (of Scioto), and the general synod of the Associate Reformed church was renewed, containing 4 synods, 28 presbyteries, 253 ministers, 367 congregations, and 31,284 members. They held to the Westminster confession, close communion, anti-slavery, and the use of only the psalms in praise.

III. In 1858 the Associate and the Associate Reformed churches were re-united under the name of The United Presbyterian church of North America. In addition to their adherence to the Westminster standards they have adopted a testimony against slavery and secret societies, and in favor of close communion, the exclusive use of the psalms in worship, and the duty of covenanting. They have three colleges, three theological and two missionary seminaries under their charge. In 1896 they reported to their general assembly 669 ministers, 948 congregations, 385 mission stations, and 109,408 members. They are active in mission work, both at home and abroad, and have successful missions in Egypt and India.

UNITED PROVINCES. See **NETHERLANDS**.

UNITED STATES OF AMERICA, THE, a federal republic composed (1897) of 45 states, 3 organized and 2 other territories, and a federal district, occupy the central portion of the continent of North America, from lat. 24° 20' to 49° n.; long. 66° 48' to 124° 32' w., bounded on the north by the British possessions of North America, from which it is partly separated by Lakes Superior, Huron, St. Clair, Erie, and Ontario, and the St. Clair, Detroit, Niagara, and St. Lawrence rivers; on the east by New Brunswick, the Atlantic Ocean, and Gulf of Mexico; on the south by the Gulf of Mexico and Mexico; and on the west by the Pacific Ocean. Its greatest length from the Atlantic to the Pacific excluding Alaska, is 3100 miles; greatest breadth, from Maine to Florida, 1780 miles; northern or British frontier, 3700 miles; Mexican, 2100 miles; ocean coast, including the various indentations, 21,354 miles, of which 12,359 are on the Atlantic, 5744 on the Gulf of Mexico, and 3251 on the Pacific. The territory of Alaska, long known as Russian America, between lat. 52° and 71° 27' n., and long. 130° 25' and 187° 36' w., now belongs to the United States.

The total area of the United States is 3,602,990 square miles, or 2,305,913,600 acres, obtained by successive annexations of territory. In 1783 the United States had an area of only 827,844 square miles; by the purchase of Louisiana from France in 1803, it acquired 1,171,931; by the cession of Florida by Spain in 1819, 59,268; by the annexation of Texas in 1845, 375,239; by the Oregon treaty with Great Britain in 1846, 280,425; by the Mexican treaties, 591,338; and by the purchase of Alaska from Russia in 1867, 577,390 square miles.

PHYSICAL CHARACTER.—Although occupying the central portion of a continent, more than two-thirds of the frontiers of the United States are shores of lakes and oceans, with numerous bays and sounds, rivers and lakes. On the Atlantic coast are Passamaquoddy Bay, Penobscot Bay, Massachusetts Bay, Long Island Sound, New York Bay, Chesapeake Bay, Albemarle and Pamlico Sounds, etc.; on the Gulf of Mexico—Tampa Bay, Apalachee Bay, Pensacola Bay, Mobile Bay, Atchafalaya Bay, Galveston Bay, Matagorda Bay, Corpus Christi Bay, etc.; and on the Pacific, the Channel of St. Barbara, Bay of Monterey, San Francisco Bay, Humboldt Harbor, Strait of Juan de Fuca, Puget's Sound, etc., and the bays and sounds of Alaska. The principal lakes, besides those divided with British America, are Lake Champlain, Lake Michigan, Great Salt Lake, Pyramid Lake, Mono Lake, Lake Tulare, and many beautiful clusters of smaller lakes in Maine, New York, Minnesota, and elsewhere.

The rivers of the United States may be classed in four divisions: 1. The Mississippi and its branches (q.v.); 2. The rivers emptying into the Atlantic or its bays and sounds—the St. Croix, Penobscot, Kennebec, Merrimac, Connecticut, Hudson, Delaware, Susquehanna, Potomac, James, Roanoke, Neuse, Cape Fear, Pedee, Santee, Savannah, Altamaha, St. John's, etc.; 3. Those, besides the Mississippi, emptying into the Gulf of Mexico—the Chattahoochee, Alabama, Tombigbee, Pearl, Sabine, Trinity, Brazos, Colorado, Nueces, and Rio Grande; 4. Those emptying into the Pacific—the Oregon or Columbia, Sacramento, San Joaquin, Colorado, etc. Besides these, there are many small rivers emptying into the great lakes, and finding their outlet through the St. Lawrence; and the rivers which empty into the salt lakes of the great interior basin of Utah. The chief mountains of America are those which belong to the great eastern chain of the Alleghanies (see APPALACHIANS) and the Rocky Mountains (q.v.).—The geology of the United States will be found described under the titles NORTH AMERICA, APPALACHIANS, ROCKY MOUNTAINS, and the several states and territories.—The soil is of every variety, from the sterile deserts of the great western plains and Utah, to the inexhaustible fertility of the bottom-lands of the Mississippi valley, where heavy crops of maize have grown for fifty successive years without manuring. The St. Lawrence basin is an elevated calcareous plain, fertile and well wooded. The Atlantic slope from Maine to New Jersey, east of the Hudson, is hilly, and best adapted for grazing; more southerly, the coast-belt is low, sandy, in places swampy, with pine-barrens, the inland region fertile, and among the best in the country. The Mississippi valley is generally level, and prairie-land of unsurpassed fertility, with a rich mold, in places 25 ft. deep. Northwest, the country rises to a high and sterile region, extending from 200 to 400 miles from the base of the Rocky Mountains. The Texas slope has rich bottom-lands on the coast, a fine rolling, fertile country, rising to a high plateau dry and sterile, except in the river-bottoms. The Pacific slope is generally sterile, except the great valleys between the mountain-ranges, and bordering the rivers, which are of great fertility. Utah, in the main, is an arid region with an abundance of alkaline substances, but has many tracts made fertile by artificial irrigation. The country east of the Mississippi, except the prairies of Illinois and Indiana, was, at its settlement, heavily wooded, and there are still vast forests of valuable timber—beech, birch, maple, oak, pine, hemlock, spruce, walnut, hickory, ash, elm, etc.; and in the south, live oak, water oak, magnolia, palmetto, tulip-tree, cypress, cotton-wood, cane, etc. West of the 97th meridian stretches a vast region of almost treeless prairies; forests again occur in the Rocky Mountains. California, Oregon, and Washington have the largest timber in the world. Information concerning the flora and fauna will be found under the head AMERICA (Botany, Zoölogy), and the names of the several states.

CLIMATE.—For a particular account of the climate of the United States, we refer to the articles RAIN and TERRESTRIAL TEMPERATURE. It is remarkable for wide transitions of cold and heat, rain and drought, except in the peninsula of Florida, where the temperature varies but 12° Fahr.; and western Oregon and Washington, where the climate is like that of England. With few exceptions, the summers are hot both north and south, the thermometer rising at times to 110° Fahr., and along the northern range of states sinking to -20°, and even sometimes as low as -40°. The whole Atlantic coast has a winter temperature 10° lower than that of western Europe in the same latitude. Thus, at New York in the latitude of Madrid, the Hudson River is frozen, and the harbor at times filled with floating ice. The causes modifying the climates of the different portions of the United States chiefly arise out of the physical features, of which the Rocky Mountains, the Gulf of Mexico, the Atlantic, and the lake system in the north are the most prominent. On the west, from the shores of the Pacific to the Cascade Mountains, one of the most important ranges of mountains in America, the climate resembles that of Great Britain more closely than that of any other country in the world, being mild and humid, with frequent showers at all seasons. But the great valley lying between the Cascade and the Rocky Mountains is almost entirely a rainless district, because the westerly winds are drained of their moisture in crossing the Cascade Mountains before arriving there. In winter it is covered with snow, but in summer is dry and arid. Owing, however, to the copious streams poured down from the melting snow, it presents abundant facilities for irrigation, so that its capabilities and resources are great if properly developed. The country east of the Rocky Mountains depends for its rain on the Gulf of Mexico, and the rainfall there is distributed most in the low

plains and least on the plateaux and mountains. Hence over this extensive district southerly winds are warm and moist, and westerly and northerly dry and cold. The result is rapid alternations of temperature, such as are never experienced in western Europe, the temperature having frequently a range in the course of a day of 50° or 60°. In the New England states, the northerly and easterly winds are cold, moist, and chilly, accompanied with frequent fogs; otherwise the climate resembles that of Great Britain. The climate of the states surrounding the great lakes in the north is mild and moist in summer as compared with the other northern states; but in winter, when the lakes are frozen over, a degree of cold is experienced greater, absolutely and relatively, than anywhere else in the states. This excessive cold is caused by the country being exposed in the north to the full sweep of the polar current from the north; but more particularly to its low-lying situation, thus forming, as it were, a vast basin into which is poured from all sides the cold, and therefore heavy, currents of air chilled by terrestrial radiation during the winter season.—The health of the United States varies with climate, elevation, etc. Swamps and river-bottoms in some regions, especially the more fertile, are malarious. The rice-swamps of Georgia and South Carolina are fatal to whites, but not to negroes. In vast tracts of new country, even the rolling and hilly, the disturbance of the soil causes intermittent fevers. Diseases of the lungs prevail in the northern and middle states; bilious fevers in the southern; in the western, intermittent and remittent bilious. The average mortality in 1890 was 19.06 per 1000; in 1896 it was 14.90. In 1890 the death-rate for native-born whites of native parentage was 17; while for native-born whites of foreign parents it was 24.42; for foreign-born whites, 19.85; and for the colored, 19.57. The high rate among the native-born whites of foreign parents probably arose from the large number of children in that class. The death-rate for the colored was nearly the same as that for all the whites, but in cities the death-rate of the colored was 34.52 as against 23.22 of the whites. In 1896 the rate was lowest in Arizona, 4, Mississippi, 6; Nebraska, 6.21; South Dakota, 7.62; Texas, 8.58; and Washington, 8.60; and highest in Louisiana, 27.14; South Carolina, 26.51; New Jersey, 21.13; District of Columbia, 20.96; Maryland, 19.57; Massachusetts, 19.35; Rhode Island, 19.31; and Tennessee, 19.21. The lowest rate in 1890 was in Mississippi, 5.88; and the highest in South Carolina, 33.41. Probably no portion of the world is more salubrious than Vermont and the eastern slope of the Alleghanies, Florida, the upper country around the Gulf of Mexico, the head-waters of the Mississippi, California and Oregon. See VITAL STATISTICS.

MINERALOGY.—The United States are rich in mineral productions. Coal is found in every state except Maine, New Hampshire, Vermont, New Jersey, Delaware, South Carolina, Louisiana, Mississippi, Minnesota, Wisconsin, and Nevada. The area of the coal-measures is estimated at 300,000 sq. miles. The whole extent of the coal area in the United States has been divided into four principal coal-fields or tracts, viz., the Great Central Alleghanian or Appalachian coal-field, extending from Tuscaloosa in Alabama, through eastern Tennessee and Kentucky, western Virginia, Maryland, Ohio, Pennsylvania, and reappearing in New Brunswick and Nova Scotia. This field has been computed to cover within the United States an area of 50,000 to 60,000 sq. miles, of which about 40,000 sq. miles area are considered workable area. It is subdivided into eight minor divisions, productive of bituminous coal. The second coal-field occupies the greater part of Illinois and Indiana, and in extent is nearly equal to the first. A third field covers a large portion of Missouri, and the fourth the greater part of the state of Michigan. The Chesterfield bituminous coal-field, a detached district of small area near Richmond, Va., contains the oldest worked collieries in America, and for many years furnished the only supply of coal for the sea-board towns. The total product in 1896 was, bituminous, 137,640,276 short tons, and anthracite, 48,010,616 long tons. Connected with the coal-fields are the petroleum springs, which form a source of great wealth to many localities. Beds of rich marl are found in a number of the eastern states, and in many, nitrates and carbonates of soda and potassia, gypsum, and marbles of great variety and some of rare beauty. Iron is found everywhere, from the pure metal in mountain masses, to bog-ore, and in many places in close proximity to coal. Lead exists in rich deposits in Missouri, Arkansas, Illinois, and Iowa. Copper is found in several states, and in great quantities of ores of 71 to 90 per cent. on the borders of lake Superior. Zinc exists in considerable quantities in New Jersey and Pennsylvania. Tin has been found in Maine and California. Silver is found in lead and copper, and in rich silver mines in New Mexico, Arizona, California, Utah, and Nevada. Gold is found in small quantities in the eastern states; in larger deposits in Virginia, North and South Carolina, and Georgia; and in great quantities in California, Oregon, Colorado, Nevada, Washington, Arizona, New Mexico, and Montana. In addition there are found platina in small, and mercury in large, quantities in California; osmium and iridium in Oregon; cobalt in North Carolina and Missouri; and nickel in Connecticut and Pennsylvania. In 1891, tin, chiefly the black oxide, was discovered in South Dakota and Wyoming; and in July of the same year, the Temescal mines in San Bernardino co., California, began shipping tin in bars to the market. These mines are claimed to have an ultimate capacity of some 2500 tons per annum, but have not as yet been fully developed. See TIN. Many valuable gems and precious stones are found in the United States, the beryl, tourmaline, garnet, corundum, agate, sapphire, and others, and a collection of these attracted much attention at the Paris Exposition of 1889.

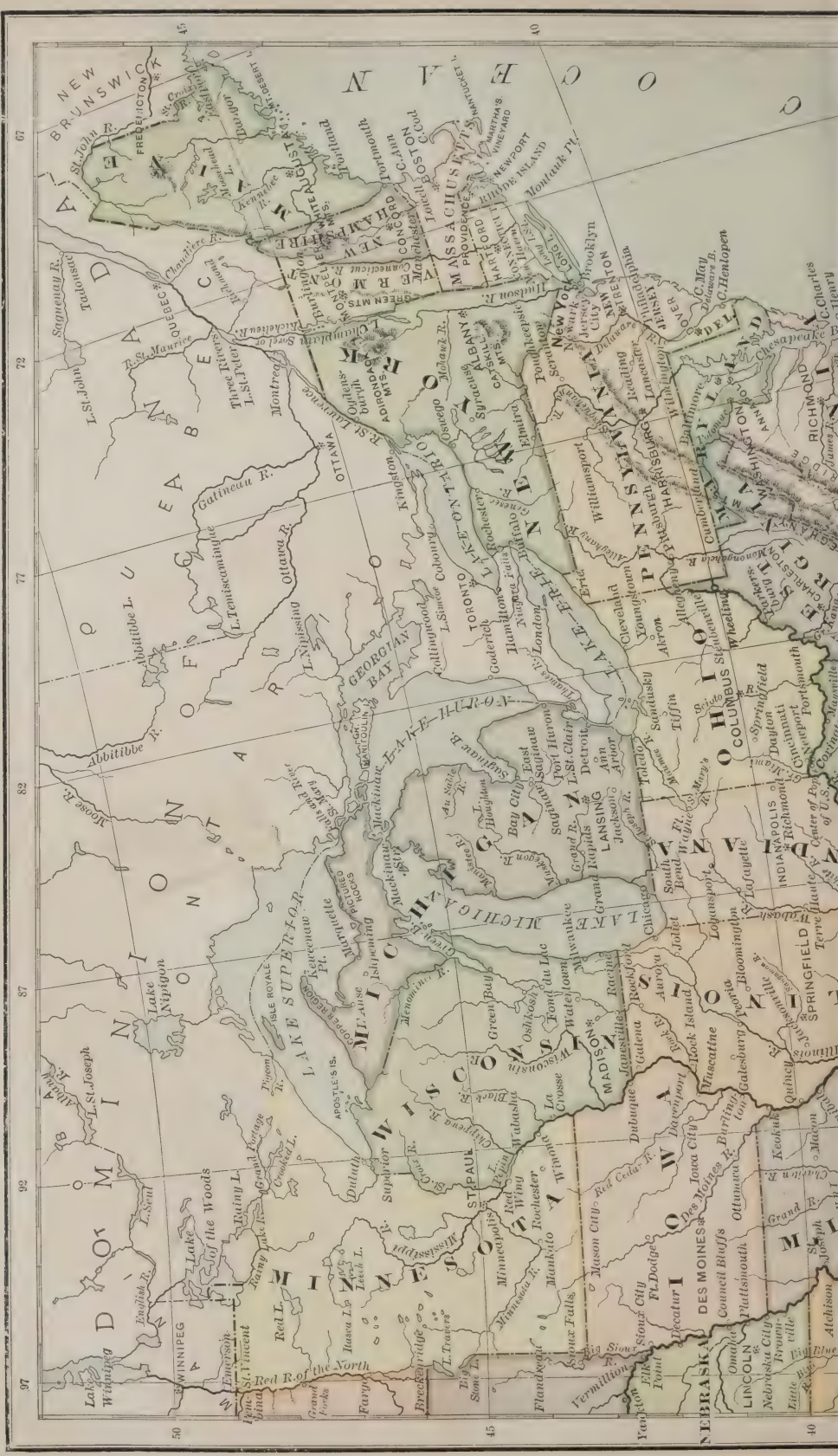
The following table shows the mineral production of the United States in the calendar year 1896, as reported by the United States Geological Survey (May 15, 1897):

MINERAL PRODUCTS OF THE UNITED STATES.

| PRODUCTS. | 1896. | |
|--------------------------------------------------------|-------------|---------------|
| | Quantity. | Value. |
| METALLIC PRODUCTS. | | |
| Pig iron, spot value.....long tons | 8,623,127 | \$90,250,000 |
| Silver, coining value.....troy ounces | 58,834,800 | 76,069,236 |
| Gold, coining value....." | 2,568,132 | 53,088,000 |
| Copper, value at New York.....lbs. | 453,007,139 | 48,698,267 |
| Lead, value at New York.....short tons | 187,000 | 10,472,000 |
| Zinc, value at New York....." | 81,499 | 6,519,920 |
| Quicksilver, value at San Francisco.....flasks | 30,765 | 1,075,449 |
| Aluminum, value at Pittsburg.....lbs. | 1,300,000 | 520,000 |
| Antimony, value at San Francisco.....short tons | 601 | 84,290 |
| Nickel, value at Philadelphia.....lbs. | 17,170 | 4,464 |
| Platinum, value (crude), San Francisco.....troy ounces | 163 | 944 |
| Total value of metallic products..... | | \$286,782,570 |
| NON-METALLIC (SPOT VALUES.) | | |
| Bituminous coal.....short tons | 137,640,276 | \$114,891,515 |
| Pennsylvania anthracite.....long tons | 48,010,616 | 81,415,785 |
| Building stone..... | | 31,346,171 |
| Petroleum.....barrels | 60,960,361 | 58,518,709 |
| Natural gas..... | | 12,450,260 |
| Brick clay..... | | 9,000,000 |
| Clay (all other than brick).....long tons | 360,000 | 800,000 |
| Cement.....barrels | 9,479,473 | 6,378,385 |
| Mineral waters.....gallons sold | 25,446,312 | 4,129,862 |
| Phosphate rock.....long tons | 948,720 | 2,868,954 |
| Salt.....barrels | 13,850,726 | 4,040,839 |
| Limestone for iron flux.....long tons | 4,120,102 | 2,060,000 |
| Zinc-white.....short tons | 20,000 | 1,400,000 |
| Gypsum....." | 224,139 | 572,344 |
| Borax.....lbs. | 13,508,000 | 675,400 |
| Mineral paints.....short tons | 48,032 | 530,455 |
| Grindstones..... | | 326,826 |
| Fibrous talc.....short tons | 46,089 | 399,443 |
| Asphaltum....." | 80,503 | 577,563 |
| Soapstone....." | 22,183 | 354,065 |
| Precious stones..... | | 97,050 |
| Pyrites.....long tons | 115,483 | 320,163 |
| Corundum and emery.....short tons | 2,120 | 113,246 |
| Oilstones, etc.....lbs. | | 127,098 |
| Mica....." | | 57,041 |
| Barytes (crude).....long tons | 17,068 | 46,513 |
| Bromine.....lbs. | 546,580 | 144,501 |
| Fluorspar.....short tons | 6,500 | 52,000 |
| Feldspar.....long tons | 7,614 | 30,700 |
| Manganese ore....." | 9,979 | 88,812 |
| Flint....." | 12,274 | 21,038 |
| Monazite.....lbs. | 30,000 | 1,500 |
| Graphite..... | | 48,460 |
| Bauxite.....long tons | 18,364 | 47,338 |
| Sulphur.....short tons | 5,260 | 87,200 |
| Fuller's earth....." | 9,872 | 59,360 |
| Marls....." | 60,000 | 30,000 |
| Infusorial earth....." | 2,846 | 16,732 |
| Millstones..... | | 22,567 |
| Chromic iron ore.....long tons | 786 | 6,667 |
| Cobalt oxide.....lbs. | 10,700 | 15,301 |
| Magnesite.....short tons | 1,500 | 11,000 |
| Asbestos....." | 504 | 6,100 |
| Rutile.....lbs. | 100 | 350 |
| Total value of non-metallic products..... | | \$334,187,373 |
| Total value of metallic products..... | | 286,782,570 |
| Estimated value of products unspecified..... | | 1,000,000 |
| Grand total..... | | \$621,969,943 |

POPULATION AND AREA. — The following table shows the population and area of the states and territories as determined at the census of 1890, the figures for 1880 being also given for purposes of comparison :

| STATES. | Admitted to the Union. | Population, 1880. | Population, 1890. | Area in Square Miles. |
|------------------|------------------------|-------------------|-------------------|-----------------------|
| Alabama..... | 1819 | 1,262,505 | 1,513,017 | 52,250 |
| Arkansas..... | 1836 | 802,525 | 1,128,179 | 53,850 |
| California..... | 1850 | 864,694 | 1,208,130 | 158,360 |
| Colorado..... | 1876 | 194,327 | 412,198 | 103,925 |
| Connecticut..... | 1788 | 622,700 | 746,258 | 4,990 |
| Delaware..... | 1787 | 146,608 | 168,493 | 2,050 |

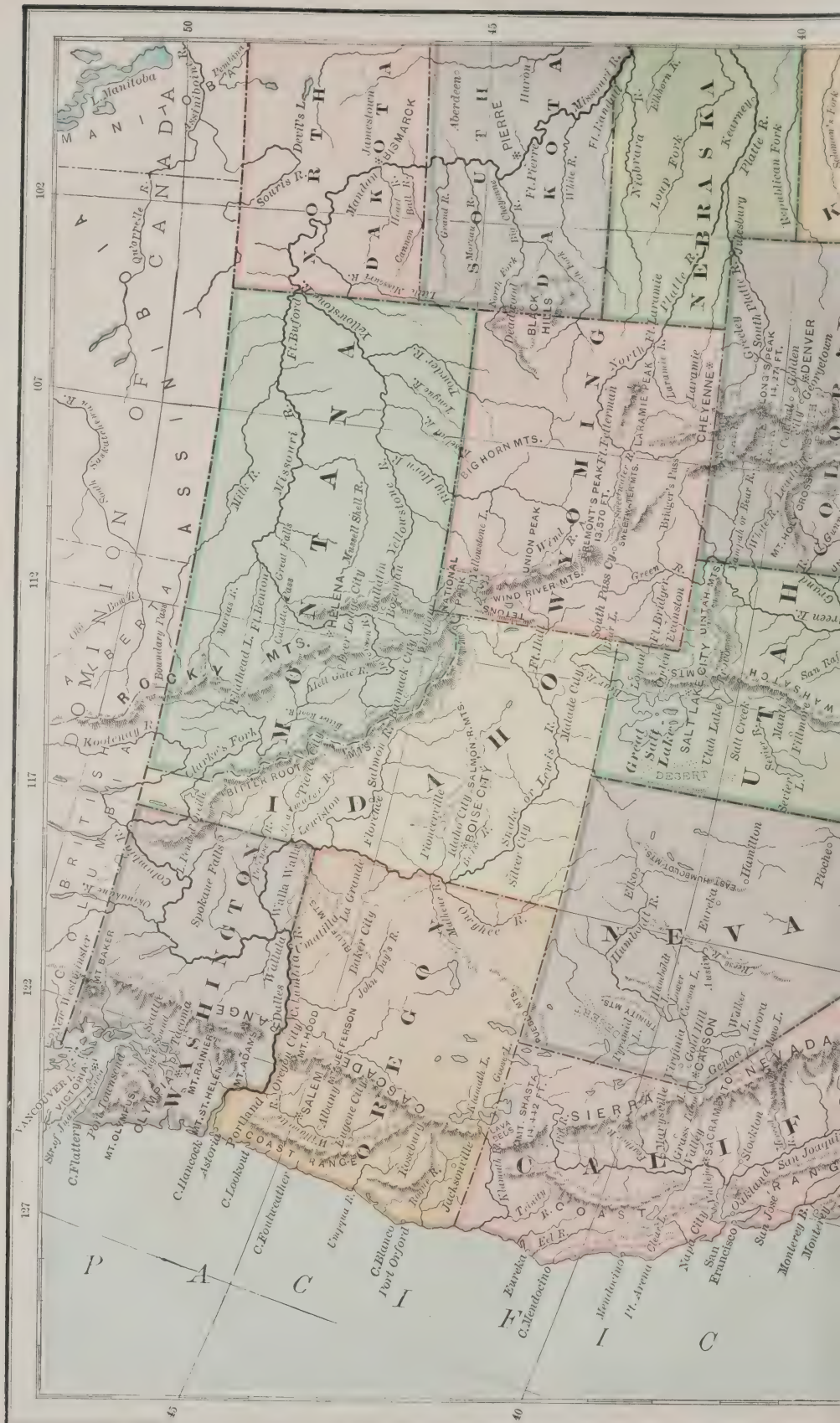


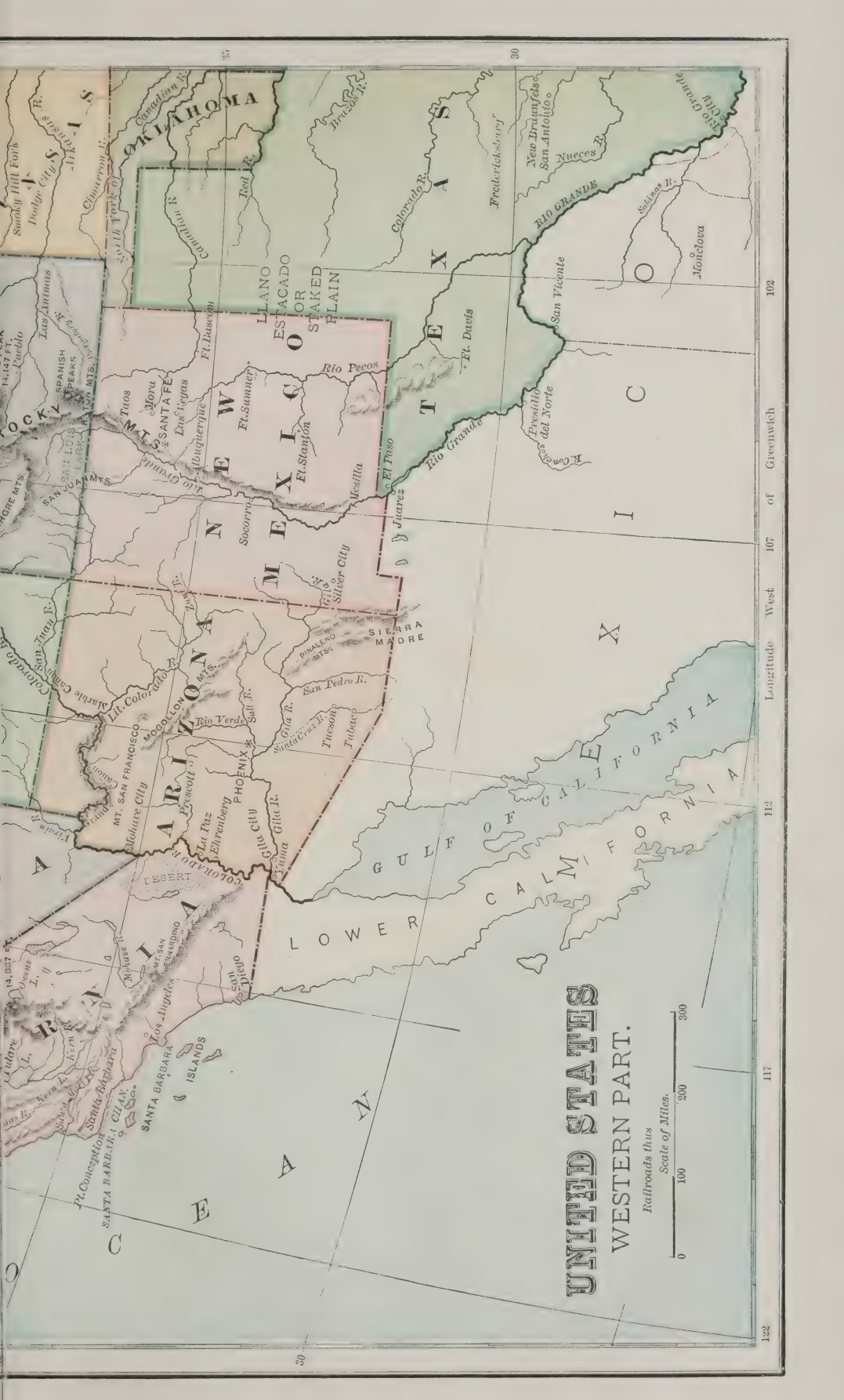


UNITED STATES
EASTERN PART.

Scale of Miles
0 100 200 300

Longitude West 87 of Greenwich 92 97





UNITED STATES WESTERN PART.

Railroads thus
Scale of Miles.
0 100 200 300

| STATES. | Admitted to the Union. | Population, 1880. | Population, 1890. | Area in Square Miles. |
|---------------------------|------------------------|-------------------|-------------------|-----------------------|
| Florida..... | 1845 | 269,493 | 391,422 | 58,080 |
| Georgia..... | 1788 | 1,542,180 | 1,837,353 | 59,475 |
| Idaho..... | 1890 | 32,610 | 84,385 | 84,800 |
| Illinois..... | 1818 | 3,077,871 | 3,826,351 | 56,650 |
| Indiana..... | 1816 | 1,978,301 | 2,192,404 | 36,350 |
| Iowa..... | 1846 | 1,624,615 | 1,911,896 | 56,025 |
| Kansas..... | 1861 | 996,096 | 1,427,096 | 82,080 |
| Kentucky..... | 1792 | 1,648,690 | 1,858,635 | 40,400 |
| Louisiana..... | 1812 | 939,946 | 1,118,587 | 48,720 |
| Maine..... | 1820 | 648,936 | 661,086 | 33,040 |
| Maryland..... | 1788 | 934,943 | 1,042,390 | 12,210 |
| Massachusetts..... | 1788 | 1,783,085 | 2,238,943 | 8,315 |
| Michigan..... | 1837 | 1,636,937 | 2,093,889 | 58,915 |
| Minnesota..... | 1858 | 780,773 | 1,301,826 | 83,365 |
| Mississippi..... | 1817 | 1,131,597 | 1,289,600 | 46,810 |
| Missouri..... | 1821 | 2,168,380 | 2,679,184 | 69,415 |
| Montana..... | 1889 | 39,159 | 132,159 | 146,080 |
| Nebraska..... | 1867 | 452,402 | 1,058,910 | 77,510 |
| Nevada..... | 1864 | 62,266 | 45,761 | 110,700 |
| New Hampshire..... | 1788 | 346,991 | 376,530 | 9,305 |
| New Jersey..... | 1787 | 1,131,116 | 1,444,933 | 7,815 |
| New York..... | 1788 | 5,082,871 | 5,997,853 | 49,170 |
| North Carolina..... | 1789 | 1,399,750 | 1,617,947 | 52,250 |
| North Dakota..... | 1889 | 36,909 | 182,719 | 70,795 |
| Ohio..... | 1802 | 3,198,062 | 3,672,316 | 41,060 |
| Oregon..... | 1859 | 174,768 | 313,767 | 96,080 |
| Pennsylvania..... | 1787 | 4,282,891 | 5,258,014 | 45,215 |
| Rhode Island..... | 1790 | 276,531 | 345,506 | 1,250 |
| South Carolina..... | 1788 | 995,577 | 1,151,149 | 30,570 |
| South Dakota..... | 1889 | 98,268 | 328,808 | 77,650 |
| Tennessee..... | 1796 | 1,542,359 | 1,767,518 | 42,050 |
| Texas..... | 1845 | 1,591,749 | 2,235,523 | 265,780 |
| Vermont..... | 1791 | 332,286 | 332,422 | 9,565 |
| Virginia..... | 1788 | 1,512,565 | 1,655,980 | 42,450 |
| Washington..... | 1889 | 75,116 | 349,390 | 69,180 |
| West Virginia..... | 1863 | 618,457 | 762,794 | 24,780 |
| Wisconsin..... | 1848 | 1,315,497 | 1,686,880 | 56,040 |
| Wyoming..... | 1890 | 20,789 | 60,705 | 97,890 |
| ORGANIZED. | | | | |
| TERRITORIES.—Alaska..... | 1868 | ..... | ..... | 577,390 |
| Arizona..... | 1863 | 40,440 | 59,620 | 113,020 |
| District of Columbia..... | 1790-91 | 177,624 | 230,392 | 70 |
| Indian..... | 1834 | ..... | ..... | 31,400 |
| New Mexico..... | 1850 | 119,565 | 153,593 | 122,580 |
| Oklahoma..... | 1890 | ..... | 61,834 | *39,030 |
| Utah..... | 1850 | 143,963 | 207,905 | 84,970 |

*Including Cherokee Country and No Man's Land.

The relative rank of the states and territories in population (1890) was: 1, New York; 2, Pennsylvania; 3, Illinois; 4, Ohio; 5, Missouri; 6, Massachusetts; 7, Texas; 8, Indiana; 9, Michigan; 10, Iowa; 11, Kentucky; 12, Georgia; 13, Tennessee; 14, Wisconsin; 15, Virginia; 16, North Carolina; 17, Alabama; 18, New Jersey; 19, Kansas; 20, Minnesota; 21, Mississippi; 22, California; 23, South Carolina; 24, Arkansas; 25, Louisiana; 26, Nebraska; 27, Maryland; 28, West Virginia; 29, Connecticut; 30, Maine; 31, Colorado; 32, Florida; 33, New Hampshire; 34, Washington; 35, Rhode Island; 36, Vermont; 37, South Dakota; 38, Oregon; 39, District of Columbia; 40, Utah; 41, North Dakota; 42, Delaware; 43, New Mexico; 44, Montana; 45, Idaho; 46, Oklahoma; 47, Wyoming; 48, Arizona; 49, Nevada.

| CENSUS YEARS. | Population of the United States. | Population of cities. | Inhabitants of cities in each 100 of the total population. |
|---------------|----------------------------------|-----------------------|------------------------------------------------------------|
| 1790..... | 3,929,214 | 131,472 | 3.35 |
| 1800..... | 5,308,483 | 210,873 | 3.97 |
| 1810..... | 7,239,881 | 356,920 | 4.93 |
| 1820..... | 9,633,822 | 475,135 | 4.93 |
| 1830..... | 12,866,020 | 864,509 | 6.72 |
| 1840..... | 17,069,453 | 1,453,994 | 8.52 |
| 1850..... | 23,191,876 | 2,897,586 | 12.49 |
| 1860..... | 31,443,321 | 5,072,256 | 16.13 |
| 1870..... | 38,558,371 | 8,071,875 | 20.93 |
| 1880..... | 50,155,783 | 11,318,547 | 22.57 |
| 1890..... | 62,622,250 | 18,284,385 | 29.12 |

The distribution in 1890 of the urban element by geographical divisions is shown by the following table:

| GEOGRAPHICAL DIVISIONS. | Urban population. | Per cent. of entire urban population. | GEOGRAPHICAL DIVISIONS. | Urban population. | Per cent. of entire urban population. |
|------------------------------|-------------------|---------------------------------------|-----------------------------|-------------------|---------------------------------------|
| Total..... | 18,284,385 | 100.00 | North Central division.... | 5,793,896 | 31.69 |
| North Atlantic division..... | 9,015,383 | 49.31 | South Central division..... | 1,147,089 | 6.27 |
| South Atlantic division..... | 1,419,964 | 7.76 | Western division..... | 908,053 | 4.97 |

In 1870 there were only 14 cities having a population of 100,000 or more; in 1880, there were 20; in 1890, 28. These were: New York, Chicago, Philadelphia, Brooklyn, St. Louis, Boston, Baltimore, San Francisco, Cincinnati, Cleveland, Buffalo, New Orleans, Pittsburg, Washington, Detroit, Milwaukee, Newark, Minneapolis, Jersey City, Louisville, Omaha, Rochester, St. Paul, Kansas City, Providence, Denver, Indianapolis, and Allegheny, the order being that of their relative rank in population. [For the names and population of the largest 50 cities of the United States in 1890, see the Appendix to vol. XV.]

Centre of Population.—On June 1, 1890, the geographical centre of population of the United States, was Greensburg, Decatur Co., Indiana. The following table shows the movement of the centre of population since 1790:

| YEARS. | North latitude. | West longitude. | Approximate location by important towns. | Westward movement during preceding decade. |
|--------|-----------------|-----------------|-----------------------------------------------------------|--------------------------------------------|
| 1790 | 39° 16.5' | 76° 11.2' | 23 miles east of Baltimore, Maryland. | ..... |
| 1800 | 39 16.1 | 76 56.5 | 18 miles west of Baltimore, Maryland. | 41 miles |
| 1810 | 39 11.5 | 77 37.2 | 40 miles n.w. by west of Washington, District of Columbia | 36 do. |
| 1820 | 39 5.7 | 78 33.0 | 16 miles north of Woodstock, Virginia. | 50 do. |
| 1830 | 38 57.9 | 79 16.9 | 19 miles west-southwest of Moorefield, West Virginia. | 39 do. |
| 1840 | 39 2.0 | 80 18.0 | 16 miles south of Clarksburg, West Virginia. | 55 do. |
| 1850 | 38 59.0 | 81 19.0 | 23 miles southeast of Parkersburg, West Virginia. | 55 do. |
| 1860 | 39 0.4 | 82 48.8 | 20 miles south of Chillicothe, Ohio. | 81 do. |
| 1870 | 39 12.0 | 83 35.7 | 48 miles east by north of Cincinnati, Ohio. | 42 do. |
| 1880 | 39 4.1 | 84 39.7 | 8 miles west by south of Cincinnati, Ohio. | 58 do. |
| 1890 | 39 11.9 | 85 32.9 | 20 miles east of Columbus, Indiana. | 48 do. |

IMMIGRATION.—No country has been peopled by such a variety of races as the United States. New England was settled by English Puritans, and a few Scotch and Welsh; New York by Dutch; Pennsylvania, by Quakers and Germans; Maryland, by English Roman Catholics; Delaware and New Jersey by Dutch and Swedes; Virginia, by English cavaliers; the Carolinas, in part by French Huguenots; Louisiana, by French; Florida, Texas, and California, by Spanish; Utah, by Mormons, chiefly from England, Wales, and Denmark. Immigration from Ireland, Germany, England, Italy, Hungary, Scotland, France, Switzerland, Sweden, has been large and progressive.

The following table shows the number of immigrants arriving in the United States, from 1820 to 1897 inclusive:

| | Total Alien Passengers per Year. | Total Alien Passengers per Year. | Total Alien Passengers per Year. | Total Immigrants for Fiscal Year ending June 30. | Total Immigrants for Fiscal Year ending June 30. |
|-----------|----------------------------------|----------------------------------|----------------------------------|--------------------------------------------------|--------------------------------------------------|
| 1820..... | 8,385 | 1837..... 79,340 | 1854..... 427,833 | 1867..... 298,967 | 1884..... 518,592 |
| 1821..... | 9,127 | 1838..... 38,914 | 1855..... 200,877 | 1868..... 282,189 | 1885..... 395,346 |
| 1822..... | 6,911 | 1839..... 68,069 | 1856..... 195,857 | 1869..... 352,669 | 1886..... 334,203 |
| 1823..... | 6,354 | 1840..... 84,066 | 1857..... 246,945 | 1870..... 387,203 | 1887..... 490,109 |
| 1824..... | 7,912 | 1841..... 80,289 | | 1871..... 321,350 | 1888..... 546,889 |
| 1825..... | 10,199 | 1842..... 104,565 | Total Immigrants per Year. | 1872..... 404,806 | 1889..... 444,427 |
| 1826..... | 10,837 | 1843..... 52,496 | | 1873..... 459,803 | 1890..... 455,302 |
| 1827..... | 18,875 | 1844..... 78,615 | | 1874..... 313,339 | 1891..... 560,319 |
| 1828..... | 27,382 | 1845..... 114,371 | 1858..... 119,501 | 1875..... 227,498 | 1892..... 623,084 |
| 1829..... | 22,520 | 1846..... 154,416 | 1859..... 118,616 | 1876..... 169,986 | 1893..... 502,467 |
| 1830..... | 23,322 | 1847..... 234,968 | 1860..... 150,237 | 1877..... 141,857 | 1894..... 314,467 |
| 1831..... | 22,633 | 1848..... 226,527 | 1861..... 89,724 | 1878..... 138,469 | 1895..... 279,948 |
| 1832..... | 60,482 | 1849..... 297,024 | 1862..... 89,007 | 1879..... 177,826 | 1896..... 343,267 |
| 1833..... | 58,640 | 1850..... 369,986 | 1863..... 174,524 | 1880..... 457,257 | 1897..... 230,832 |
| 1834..... | 65,365 | 1851..... 379,466 | 1864..... 193,195 | 1881..... 669,431 | |
| 1835..... | 45,374 | 1852..... 371,603 | 1865..... 247,453 | 1882..... 788,992 | Total .....18,235,393 |
| 1836..... | 76,242 | 1853..... 368,645 | 1866..... 163,694 | 1883..... 603,322 | |

From 1821 to 1860 more than half of the immigrants came from England and Ireland, and over one-third were from Ireland. From 1841 to 1850 the Irish immigration was 45% of the whole; from 1851 to 1860 the Germans were 36.6% of the whole; and since then the relative number of Irish, Germans and English has declined, while that of the immigrants from s. and e. Europe has increased.

Of the largely decreased number of immigrants in the year ending June 30, 1897, (230,892), 216,397 were from Europe; 91 from Mexico; 6 from Central America; 290 from British North America; and the remainder from countries, provinces, and parts unspecified. The largest numbers were from Italy, 59,431; Ireland, 28,421; Russia, 22,750; Germany, 22,533; Hungary, 15,025; Sweden, 13,144; unspecified parts of Austria, 10,285; England, 9974; Norway, 5842; Galicia and Bukowina (Austria-Hungary), 5767; Turkey in Asia, 4732; Poland, 4165; Cuba, 3553; and China, 3363.

GOVERNMENT.—The form of government of the United States is based on the Constitution of Sept. 17, 1787, to which ten amendments were added Dec. 15, 1791; an eleventh amendment, Jan. 8, 1798; a twelfth amendment, Sept. 25, 1804; a thirteenth amendment, Dec. 18, 1865; a fourteenth amendment, July 28, 1868, and a fifteenth amendment, March 30, 1870. See CONSTITUTION.

By this Constitution, the government of the nation is intrusted to three separate authorities—the Executive, the Legislative, and the Judicial. The executive power is vested in a President, who holds his office during the term of four years, and is elected, together with a Vice-President chosen for the same term, in the mode prescribed as follows: “Each state shall appoint, in such manner as the Legislature thereof may direct, a number of electors, equal to the whole number of senators and representatives to which the State may be entitled in the Congress; but no senator or representative, or person holding an office of trust or profit under the United States, shall be appointed an elector.” The Constitution enacts that “the Congress may determine the time of choosing the electors, and the day on which they shall give their votes, which day shall be the same throughout the United States;” and further, that “no person, except a natural-born citizen, or a citizen of the United States at the time of the adoption of this Constitution, shall be eligible to the office of President; neither shall any person be eligible to that office who shall not have attained to the age of thirty-five years, and been fourteen years a resident within the United States.”

The President is commander-in-chief of the army and navy, and of the militia in the service of the Union. He has the power of veto on all laws passed by Congress; but, notwithstanding his veto, any bill may become law on its being afterwards passed by each house of Congress by a two-thirds vote. The Vice-President is ex-officio President of the Senate; and in case of the death or resignation of the President, he becomes the President for the remainder of the term. The elections for President and Vice-President are at present held in all the states on Tuesday next after the first Monday in November, every leap-year; and on the 4th of March following the new President-elect assumes office.

The administrative business of the nation is conducted by eight Secretaries, or heads of departments, who form what is called the Cabinet. They are chosen by the President, but must be confirmed by the Senate. Each of them presides over a separate department, and must act under the immediate authority of the President.

Their official titles are: Secretary of State, Secretary of the Treasury, Secretary of War, Secretary of the Navy, Secretary of the Interior, Postmaster General, Attorney General, Secretary of Agriculture.

By the law which came into force Jan. 19, 1886, it is provided that in case of the death, resignation, or disability of both President and Vice-President, the members of the Cabinet in the following order shall act as President until the disability of the President is removed, or a President shall be elected: 1. Secretary of State; 2. Secretary of the Treasury; 3. Secretary of War; 4. Attorney General; 5. Postmaster General; 6. Secretary of the Navy; 7. Secretary of the Interior.

Each of the above Secretaries has an annual salary of \$8000, and holds office only during the pleasure of the President. The whole legislative power is vested by the Constitution in a Congress, consisting of a Senate and House of Representatives. The Senate consists of two members from each state, chosen by the state legislatures for six years. Senators must be not less than thirty years of age; must have been citizens of the United States for nine years, and residents in the states for which they are chosen. Besides its legislative capacity, the Senate is intrusted with the power of ratifying or rejecting all treaties made by the President with foreign powers, a two-thirds majority of senators present being required for ratification. The Senate is also invested with the power of confirming or rejecting all appointments to office made by the President, and its members constitute a High Court of Impeachment. The judgment in the latter case extends only to removal from office and disqualification. Representatives have the sole power of impeachment.

The House of Representatives is composed of members elected every second year by the vote of all male citizens over the age of 21 of the several states of the Union, who are duly qualified and registered in accordance with the laws of their respective states. By the 15th Amendment to the Constitution, neither race nor color affects the right of citizens. The franchise is not absolutely universal; residence for at least one year in most states (in Michigan and Maine three months) is necessary; in some states the payment of taxes, in others registration. Untaxed Indians are excluded from the franchise; in most states convicts, in some states duellists and fraudulent voters; in Massachusetts, voters are required to be able to read English. The number of members to which each state is entitled is determined by the census taken every ten years. By the Apportionment Bill consequent on the census of 1890, the number of representatives was 356, distributed as follows:

| | | | | | |
|-----------------------|----|-------------------------|----|-------------------------|----|
| Alabama | 9 | Illinois | 22 | Michigan | 12 |
| Arkansas | 6 | Indiana | 13 | Minnesota | 7 |
| California | 7 | Iowa | 11 | Mississippi | 7 |
| Colorado | 2 | Kansas | 8 | Missouri | 15 |
| Connecticut | 4 | Kentucky | 11 | Montana | 1 |
| Delaware | 1 | Louisiana | 6 | Nebraska | 6 |
| Florida | 2 | Maine | 4 | Nevada | 1 |
| Georgia | 11 | Maryland | 6 | New Hampshire | 2 |
| Idaho | 1 | Massachusetts | 13 | New Jersey | 8 |

| | | | | | |
|--------------------------|----|--------------------------|----|-------------------------|----|
| New York | 34 | Rhode Island | 2 | Virginia | 10 |
| North Carolina | 9 | South Carolina | 7 | Washington | 2 |
| North Dakota | 1 | South Dakota | 2 | West Virginia | 4 |
| Ohio | 21 | Tennessee | 10 | Wisconsin | 10 |
| Oregon | 2 | Texas | 13 | Wyoming | 1 |
| Pennsylvania | 30 | Vermont | 2 | | |

Total.... 356

This is 31 more than in the previous decade.

On the basis of the 1890 census there is one representative to every 173,901 inhabitants. The popular vote for President in 1896 was 13,923,643, or over one in five of the entire estimated population (71,468,000).

According to the terms of the Constitution, representatives must not be less than twenty-five years of age, must have been citizens of the United States for seven years, and be residents in the states from which they are chosen. In addition to the representatives from the states, the House admits a delegate from each organized Territory, who has the right to speak on any subject and to make motions, but not to vote. The delegates are elected in the same manner as the representatives. In Wyoming and Utah the franchise is accorded to women.

Every bill that has passed the House of Representatives and the Senate must, before it becomes a law, be presented to the President of the United States; if not approved, he may return it, with his objections, to the House in which it originated. If after reconsideration two-thirds of that House agree to pass the bill, it must be sent, together with the objections, to the other House, by which it must be likewise reconsidered, and if approved by two-thirds of that House, it becomes a law. But in all such cases the votes of both Houses are determined by yeas and nays, and the names of the persons voting for and against the bill are entered on the journal of each House. Should the President fail to return any Act presented to him for approval to the house of Congress in which it originated, within ten days prescribed by the Constitution, it becomes a law without his approval.

Each of the two houses of Congress is made by the Constitution the judge of the elections, returns, and qualifications of its own members; and each of the Houses may, with the concurrence of two-thirds, expel a member.

The Congress of the United States has the power to propose alterations in the Constitution by the 5th article of the same. This article orders that the Congress, whenever two-thirds of both Houses shall deem it necessary, shall propose amendments to the Constitution, or, on the application of the Legislatures of two-thirds of all the States, shall call a convention for proposing the amendments, which in either case shall be valid to all intents and purposes as part of the Constitution when ratified by the Legislatures of three-fourths of the several States, or by conventions in three-fourths thereof, as the one or other mode of ratification may be proposed by Congress.

By the constitution, the states granted to Congress power "to lay and collect taxes, duties, imports, and excises, to pay the debts and provide for the common defense and general welfare of the United States;" to borrow money; to regulate commerce; to establish uniform naturalization and bankruptcy laws; to coin money, and fix the standards of weights and measures, and punish counterfeiting; to establish post-offices and post roads; to secure patents and copyrights; punish piracies; declare war; raise armies and navy; to call out the militia, reserving to the states to appoint their officers, and to govern the District of Columbia, and all places purchased for forts, arsenals, etc., with the consent of the state legislatures. All powers not expressly granted are reserved to the states or the people; but the states, though sovereign and independent under the constitution, with all powers of local legislation, eminent domain (i.e., absolute possession of the soil), and power of life and death, with which neither President nor Congress can interfere, cannot make treaties, coin money, levy duties on imports, or exercise the powers granted to Congress.

Under an Act of Congress approved Jan. 20, 1874, the salary of a senator, representative, or delegate in Congress is \$5000 per annum, with traveling expenses. These expenses are calculated by the most direct route of usual travel, and for a similar return, one for each session of Congress. The salary of the Speaker of the House of Representatives is, under the same act of Congress, \$8000 per annum.

The times, places, and manner of holding elections for senators and representatives are by the Constitution allowed to be prescribed in each state by the legislature thereof; but Congress may at any time by law alter such regulations, or make new ones, except as to the places of choosing senators. Under this provision a law has been passed prescribing a method of choosing senators. No senator or representative can, during the time for which he is elected, be appointed to any civil office under authority of the United States which shall have been created, or the emoluments of which shall have been increased, during such time; and no person holding any office under the United States can be a member of either House during his continuance in office. No religious test is required as a qualification to any office or public trust under the United States.

The period usually termed a Congress, in legislative language, continues for two years; as, for example, from noon, March 4, 1897, until noon, March 4, 1899, at which

latter time the term of the representatives to the 55th Congress expires, and the term of the new House of Representatives commenced.

The power to enact laws which concern only the states directly and immediately, is among the reserved rights of the states, and as such is vested in the state legislatures. The constitutions of the several states all agree in their main features, and the modes of administration are virtually alike. In all there is the same form, and the same principles lie at the foundation. The executive in every state is vested in a Governor. The duties of the Governor are in general analogous to those of the President, as far as the several state governments are analogous to that of the Union. In some states the governors have the nomination, and, in conjunction with the senate, the appointment, of many important officers; but in most states appointments in the power of the Governors are comparatively unimportant; in New York, for example, nearly all officers and all judges are elected by the people. Like the President, governors make recommendations to the legislature, and take care that the laws are executed. Like the President, they may be impeached and removed for treason, bribery, or other crimes.

The District of Columbia is the seat of the United States government, and was provided by the State of Maryland for the purposes of the government in 1791. It is now co-extensive with the city of Washington, and embraces an area of 70 square miles. The District has no municipal legislative body, and its citizens have no right to vote either in national or municipal concerns. By an Act of Congress of 1878, its municipal government is administered by three commissioners, appointed by the President.

The judiciary consists of a Supreme Court, with one chief justice and eight associate justices, appointed by the President for life; nine circuit courts, each presided over by a justice of the supreme court, and having from one to three circuit judges each; a court of claims, with a chief justice and four associate judges; and a supreme court and a court of appeals exclusively for the District of Columbia. The Supreme Court has jurisdiction in all cases arising under the Constitution, laws, and treaties of the United States; causes affecting ambassadors and consuls, of admiralty and jurisdiction; controversies to which the United States is a party, or between a state and the citizens of another state, citizens of different states, citizens and foreign states. It has original jurisdiction in state cases, or those affecting ambassadors or consuls—in others appellate. A person may be tried for treason, both against the federal government, and against the state of which he is citizen. The President can reprieve or pardon a person condemned by a federal court; but has no power to interfere with the judgments of state tribunals. The citizens of each state are entitled to all privileges and immunities of the several states. Criminals escaping from one state to another are given up for trial on demand of the executive; and the constitution declared, before the civil war, that "no person held to service or labor in one state, under the laws thereof, escaping into another, shall, in consequence of any law or regulation therein, be discharged from such service or labor, but shall be delivered up on claim of the party to whom such service or labor may be due." See DRED SCOTT CASE. In 1891 there were established nine district courts of appeal, one for each district, with a view to lightening the labors of the Supreme Court and hastening the disposal of cases.

MONEY.—Up to the year 1786, the circulating medium of the United States had been in a state of the greatest confusion. In colonial times, the standards of exchange and the monetary system had been those of England, though Spanish silver circulated extensively by reason of the colonial trade with the Spanish West Indies. As early as 1782, however, the Continental Congress took up the subject of a coinage, and at the request of Robert Morris, a report on the question of a national currency was prepared by Gouverneur Morris. Mr. Morris endeavored to harmonize the moneys of all the colonies, and starting with a definite fraction as a unit, he recommended the following table as the basis of our monetary system:

Ten units to equal one penny.
 Ten pence to equal one bill.
 Ten bills to equal one dollar (worth \$0.75).
 Ten dollars to equal one "crown."

A second report, however, was drawn up by Thomas Jefferson, which agreed with the report of Mr. Morris in recommending a decimal system, but proposing a different set of coins—a gold piece of ten dollars (the "eagle"), a silver dollar, a silver tenth of a dollar (a "dime"), and a copper hundredth of a dollar (a "cent"). This report was finally adopted by Congress in 1785, though no Mint was established until 1795. This system of Mr. Jefferson's still remains the base of the coinage of the United States, there having been added the double-eagle of gold (\$20), the half-eagle of gold (\$5), the quarter-eagle of gold (\$2.50), the gold dollar—the coinage of the last having been discontinued in 1890—and in silver, the half-dollar, the quarter-dollar, the five and three-cent pieces; and in metal, the five-cent and three-cent pieces. Half-cent pieces were at one time coined.

The United States has also a convenient system of paper money, redeemable in gold or silver at the National Treasury or Sub-Treasury; and special certificates entitling the bearer to gold or silver, known respectively as gold certificates and silver certificates. This system will be found described in detail under the title **MONEY**.

FINANCE.—The revenue of the United States is mainly derived from two sources—namely, duties on imports, and internal revenue taxes upon distilled spirits, fermented liquors, tobacco, banks, and bankers. The national expenditure is mainly on account of the war and navy departments, pensions, payment of interest of the public debt incurred by the civil war of 1861–66, and the civil service.

The following table exhibits the total ordinary revenue and the total ordinary expenditure of the United States in each of the fiscal years, ending June 30, from 1881 to 1896:

| REVENUE. | | EXPENDITURE. | REVENUE. | | EXPENDITURE. |
|----------------------|-------------|--------------|----------------------|-------------|--------------|
| Year ending June 30. | Dollars. | Dollars. | Year ending June 30. | Dollars. | Dollars. |
| 1881 | 360,782,292 | 260,712,887 | 1889 | 387,050,058 | 299,288,978 |
| 1882 | 403,525,250 | 257,981,440 | 1890 | 463,963,080 | 358,618,584 |
| 1883 | 398,287,581 | 265,408,138 | 1891 | 458,544,233 | 421,304,470 |
| 1884 | 348,519,869 | 244,126,244 | 1892 | 425,868,260 | 415,953,807 |
| 1885 | 323,690,706 | 260,226,935 | 1893 | 461,716,562 | 459,374,888 |
| 1886 | 336,439,727 | 242,483,138 | 1894 | 372,802,498 | 442,605,759 |
| 1887 | 371,403,277 | 267,932,180 | 1895 | 390,373,203 | 433,178,426 |
| 1888 | 379,266,074 | 267,924,801 | 1896 | 409,475,408 | 434,678,654 |

These figures are exclusive of loans in the revenue and expenditure, other than interest, and premiums in connection with the public debt.

The following table gives the actual sources of revenue and branches of expenditure for the fiscal year ending June 30, 1896.

| REVENUE. | 1896. | EXPENDITURE. | 1896. |
|-----------------------|---------------|--------------------------------|---------------|
| Customs revenue..... | \$160,021,752 | Legislative..... | \$9,460,958 |
| Internal revenue..... | 146,762,865 | Executive department..... | 192,919 |
| Postal service..... | 82,499,208 | State..... | 1,755,814 |
| Miscellaneous..... | 20,191,533 | Treasury..... | 77,108,089 |
| | | War..... | 52,947,075 |
| | | Navy..... | 27,554,733 |
| | | Interior..... | 160,194,984 |
| | | Post-office..... | 94,218,225 |
| | | Department of agriculture..... | 2,905,669 |
| | | “ labor..... | 163,945 |
| | | “ justice..... | 303,243 |
| | | Judicial..... | 7,873,000 |
| Total Receipts..... | \$409,475,408 | Total disbursements..... | \$434,678,654 |

The true valuation of real and personal property in the United States in 1890 was \$65,037,091,197; assessed valuation \$25,425,863,485. The aggregate national debt, including certificates and treasury notes on June 30, 1897, was \$1,818,672,665. (See DEBT, NATIONAL.)

The following statement shows the statistics of the circulating medium of various kinds on July 1, 1897.

| CIRCULATING MEDIUM. | General Stock, Coined or Issued. | In Treasury. | Amount in Circulation. |
|-----------------------------------|----------------------------------|---------------|------------------------|
| Gold coin..... | \$671,676,250 | \$152,529,575 | \$519,146,675 |
| Silver, standard dollars..... | 451,993,742 | 399,992,540 | 52,001,202 |
| Silver, subsidiary..... | 75,438,884 | 16,210,344 | 59,228,540 |
| Notes, United States..... | 346,681,016 | 98,097,438 | 248,583,578 |
| Notes, treasury, act of 1890..... | 114,867,230 | 30,962,083 | 83,905,197 |
| Notes, national bank..... | 231,441,686 | 5,030,919 | 226,410,767 |
| Certificates, gold..... | 38,782,169 | 1,496,250 | 37,285,919 |
| Certificates, silver..... | 375,479,504 | 17,143,136 | 358,336,368 |
| Certificates, currency..... | 61,750,000 | 620,000 | 61,130,000 |
| Totals..... | | \$722,082,285 | \$1,646,028,246 |

ARMY OF THE UNITED STATES.—During the war of the revolution the army included regular troops furnished by the several states, according to quota allotment and state militia. The official returns made to the war office show that there were under continental pay during the war the following number of men contributed by the different states :

| | 1775. | 1776. | 1777. | 1778. | 1779. | 1780. | 1781. | 1782. | 1783. |
|---------------------|--------|--------|--------|-------|-------|-------|-------|-------|-------|
| New Hampshire | 2,824 | 3,019 | 2,283 | 1,283 | 1,004 | 1,777 | 700 | 744 | 733 |
| Massachusetts | 16,444 | 17,372 | 10,591 | 8,937 | 6,287 | 7,889 | 5,298 | 4,423 | 4,370 |
| Rhode Island..... | 1,193 | 1,900 | 548 | 3,056 | 1,263 | 915 | 464 | 451 | 372 |
| Connecticut..... | 4,507 | 12,127 | 4,563 | 4,010 | 3,544 | 3,687 | 3,921 | 1,732 | 1,740 |
| New York..... | 2,075 | 5,744 | 2,832 | 2,194 | 2,256 | 2,847 | 1,178 | 1,198 | 1,169 |
| Pennsylvania..... | 400 | 10,395 | 7,464 | 3,684 | 3,476 | 3,337 | 1,346 | 1,265 | 1,598 |
| Virginia..... | 3,180 | 6,181 | 7,013 | 5,230 | 3,973 | 2,886 | 4,119 | 1,204 | 629 |
| North Carolina..... | 2,000 | 1,134 | 1,281 | 287 | 3,920 | ..... | ..... | 1,105 | 697 |
| South Carolina..... | 4,000 | 2,069 | 1,650 | 1,650 | ..... | ..... | ..... | ..... | 139 |
| Georgia..... | 1,000 | 351 | 1,423 | 678 | 87 | ..... | ..... | ..... | 145 |
| New Jersey..... | ..... | 9,086 | 1,408 | 1,586 | 1,276 | 1,267 | 823 | 660 | 676 |
| Delaware..... | ..... | 754 | 299 | 349 | 317 | 556 | 89 | 164 | 235 |
| Maryland..... | ..... | 3,329 | 3,565 | 3,307 | 2,849 | 2,065 | 2,107 | 1,280 | 974 |
| | 37,623 | 63,061 | 44,920 | | | | | | |

On June 12, 1776, Congress passed a resolution organizing the war office ; or, as it was then termed, the Board of War and Ordnance, and which consisted of 5 members. In the following year this was reorganized, a board of war being provided for to consist of three persons not members of Congress. Afterwards a medical inspection and pay department were added ; and in 1781 the office of Secretary at War was created and his powers and duties defined. Gradually the entire official direction of the war establishment was placed in the hands of this official, subject to the orders of the President, *ex-officio* Commander-in-Chief, this latter provision occurring after the adoption of the constitution in 1789, when also the style and title of the secretary were changed from Secretary at War to Secretary of War, which it has remained ever since. In 1812 the Quartermaster-General's department, purchasing department, and ordnance department were organized. After the close of the war of the revolution, and when Washington had laid down his command, the continental army was soon disbanded. In 1798, when war with France was actually begun upon the sea, a new army was hastily organized to repel the anticipated invasion of the United States by a French force. Gen. Washington was placed in command, and preparations for a prolonged and doubtful struggle were carried into effect. But the army was not called into action, negotiations with Napoleon I. reconciling the differences between the two countries, and the men were presently again disbanded. The acts of the Congress of the Confederation concerning the organization of the army were, up to this time, as follows : The act of Sept. 29, 1789, by which " a corp of 700 rank and file (to be stationed on the frontier) to be organized, together with two companies of artillery, raised by resolve of Oct. 20, 1786," and the act of April 30, 1790, in lieu of the preceding act, to regulate and establish one battalion of artillery, and one regiment of infantry—in all, 1216 men. In 1791 an act was passed (March 3) organizing one additional regiment of infantry ; in 1792 to these were added one squadron of light dragoons and 3 regiments and 5 battalions of infantry ; in 1794 an act was passed to establish arsenals and military stores ; and another to organize a corps of artillerists and engineers ; and to this was added in 1798 a second regiment of artillerists and engineers. The act of May 28, 1798, in view of the prospective war with France, authorized the President to raise a provisional army of 10,000 rank and file, to be organized into corps of artillery, cavalry, and infantry, and authorized also the appointment of a Lieutenant General, " to command the armies of the United States," Gen. Washington being so appointed ; and a supplementary act (July 16, 1798), still further increased the authorization to the President by the number of 12 regiments of infantry, with the necessary commanding officers and staff, line officers, etc. The act of March 3, 1799 abolished the title and office of Lieutenant General, and directed that the commander of the army of the United States should be commissioned by the title of the " General of the armies of the United States." The opening of the war of 1812 with England brought about an increase of the army by Congress, and directed that it should include 25 regiments of infantry, with the necessary officers ; and 20 regiments of infantry in addition if needed, with 3 regiments of riflemen. The act of Feb. 8, 1815, organized the ordnance department ; and that of March 3, 1815, fixed the peace establishment at not exceeding 10,000 men. In 1821 a still greater reduction was made ; and when the Florida war broke out in 1834, the army comprised the staff, one regiment of dragoons, 4 regiments of artillery, and 7 of infantry, commanded by a Major General and two brigadiers.

TABLE SHOWING THE NUMBER OF MEN AND CASUALTIES IN THE REGULAR AND VOLUNTEER FORCES DURING THE WAR WITH MEXICO—1846 TO 1848.

| STATE. | Strength. | Killed. | Died of Wounds. | Wounded. |
|---------------------------------------------------|-----------|---------|-----------------|----------|
| Regular army, including marines..... | 42,545 | 536 | 408 | 2,102 |
| Alabama Volunteers..... | 3,036 | ... | ... | ... |
| Arkansas "..... | 1,323 | 19 | 2 | 32 |
| California "..... | 571 | ... | ... | ... |
| Florida "..... | 370 | ... | ... | ... |
| Georgia "..... | 2,132 | 6 | ... | 8 |
| Illinois "..... | 6,123 | 86 | 12 | 160 |
| Indiana "..... | 4,585 | 47 | ... | 92 |
| Iowa "..... | 253 | ... | ... | ... |
| Kentucky "..... | 4,842 | 78 | 4 | 105 |
| Louisiana "..... | 7,947 | 13 | 2 | 8 |
| Maryland and District of Columbia Volunteers..... | 1,355 | 8 | 3 | 21 |
| Massachusetts Volunteers..... | 1,057 | ... | ... | ... |
| Michigan "..... | 1,103 | ... | ... | ... |
| Mississippi "..... | 2,433 | 54 | 4 | 108 |
| Missouri "..... | 7,016 | 20 | 3 | 46 |
| New Jersey "..... | 425 | ... | ... | ... |
| New York "..... | 2,396 | 24 | 19 | 156 |
| North Carolina "..... | 935 | ... | ... | ... |
| Ohio "..... | 5,536 | 18 | ... | 39 |
| Pennsylvania "..... | 2,503 | 21 | 14 | 162 |
| South Carolina "..... | 1,077 | 30 | 26 | 214 |
| Tennessee "..... | 5,865 | 43 | 6 | 129 |
| Texas "..... | 8,018 | 42 | 4 | 29 |
| Virginia "..... | 1,320 | ... | ... | 4 |
| Wisconsin "..... | 146 | ... | ... | ... |
| Mormons "..... | 555 | ... | ... | ... |
| Re-mustered "..... | 844 | 4 | 1 | 3 |

During the civil war the number of men furnished to the northern armies was 2,778,304, or, reduced to a three years' standing, 2,326,168. They were organized into the Army of the Potomac, Army of the Tennessee, Army of the Cumberland, and Army of the Ohio; the last three being finally united into the Military Division of the Mississippi. These armies were raised under proclamation by the President—each state furnishing its quota, according to population, by voluntary enlistment, and by enforced draft. Regimental organizations, when formed, were mustered into the service of the United States, when they fell under the direction of the war department, and were assigned to brigades, divisions, corps, and armies, as required. All generals and general staff officers received their commissions from the President, line officers being appointed before mustering into the United States service. Toward the close of the war the difficulty of obtaining volunteers so increased that large bounties were offered, in some cases amounting to as much as \$1500 for one man. At the close of the war the volunteer army which was mustered out numbered about 1,100,000 men. The regular army was increased during the progress of the war from 18,000 men to 50,000; since the war it has been reduced to 25,000.

On Jan. 1, 1896, the army of the United States comprised 26,955 officers and enlisted men, divided as follows:

| | OFFICERS. | ENLISTED MEN. |
|------------------------------------------------------------------------------------------------------------------------------------|-----------|---------------|
| 10 cavalry regiments..... | 454 | 6,045 |
| 5 artillery regiments..... | 292 | 3,803 |
| 25 infantry regiments..... | 897 | 12,544 |
| Engineer battalion, recruiting parties, ordnance department, hospital service, Indian scouts, West Point, and general service..... | 528 | 2,392 |
| | 2,171 | 24,784 |

By an order of the Secretary of War, issued July 3, 1891, the old distribution of the army by Divisions was abolished, and a single organization by Departments left. On Jan. 1, 1897, these departments were as follows:

1. Department of the East: Headquarters, Governor's Island, N. Y. City, Maj.-Gen. Thomas H. Ruger, commanding.
2. Department of the Missouri (Michigan, Wisconsin, Indiana, Illinois, Missouri, Kansas, Arkansas, Oklahoma, Indian Territory): Headquarters, Chicago, Ill., Maj.-Gen. Wesley Merritt, commanding.
3. Department of the Platte: Headquarters, Omaha, Neb., Brig.-Gen. John J. Coppinger, commanding.
4. Department of Dakota: Headquarters, St. Paul, Minn., Brig.-Gen. John R. Brooke, commanding.
5. Department of Texas: Headquarters, San Antonio, Tex., Brig.-Gen. Zenas R. Bliss, commanding.

6. Department of California: Headquarters, Los Angeles, Cal., Brig.-Gen. James W. Forsyth, commanding.

7. Department of the Columbia: Headquarters, Vancouver Barracks, Wash., Brig.-Gen. Elwell S. Otis, commanding.

The medical department of the United States army is allowed by law to consist of 1 surgeon-general, with the rank of Brig.gen.; 1 assistant surgeon-gen., with the rank of col. of cavalry; 1 chief medical purveyor; 4 surgeons, with the rank of col.; 2 assistant medical purveyors; 8 surgeons, with the rank of lieut.col.; 50 surgeons, with the rank of maj.; 125 assistant surgeons, with the rank of lieuts. of cavalry for the first 5 years' service, and of capt. of cavalry after 5 years' service. No person shall be appointed an assistant surgeon unless he shall have been examined and approved by an army medical board, to consist of not less than three surgeons or assistant surgeons, who shall be designated for that purpose by the Secretary of War, and no person shall receive the appointment of surgeon unless he shall have served at least five years as an assistant surgeon. He must also be examined by an army medical board. All candidates for appointment in the medical corps of the army must apply to the Secretary of War to be admitted to examination, and such candidates must be between 21 and 28 years of age, and graduates of a regular medical college; and the morals, habits, physical and mental qualifications, and general aptitude for the service are subjects for examination by the board.

PAY OF THE ARMY OF THE UNITED STATES.

| GRADE. | Pay of officers in active service. | | | | | Pay of retired officers. | | | | |
|------------------------------------|------------------------------------|---------|---------|---------|---------|--------------------------|-------|-------|-------|-------|
| | Yearly Pay. | | | | | Yearly Pay. | | | | |
| | \$ | 10 p.c. | 20 p.c. | 30 p.c. | 40 p.c. | | | | | |
| General..... | 13,500 | | | | | | | | | |
| Lieutenant-general..... | 11,000 | | | | | | | | | |
| Major-general..... | 7,500 | | | | | \$5,625 | | | | |
| Brigadier-general..... | 5,500 | | | | | 4,125 | | | | |
| Colonel..... | 3,500 | 3,850 | 4,200 | 4,500 | 4,500 | 2,625 | 2,887 | 3,150 | 3,375 | 3,375 |
| Lieutenant-colonel..... | 3,000 | 3,300 | 3,600 | 3,900 | 4,000 | 2,250 | 2,475 | 2,700 | 2,925 | 3,000 |
| Major..... | 2,500 | 2,750 | 3,000 | 3,250 | 3,500 | 1,875 | 2,062 | 2,250 | 2,437 | 2,625 |
| Captain—mounted..... | 2,000 | 2,200 | 2,400 | 2,600 | 2,800 | 1,500 | 1,650 | 1,800 | 1,950 | 2,100 |
| Captain—not mounted..... | 1,800 | 1,980 | 2,160 | 2,340 | 2,520 | 1,350 | 1,485 | 1,620 | 1,755 | 1,890 |
| Regimental adjutant..... | 1,800 | 1,980 | 2,160 | 2,340 | 2,520 | | | | | |
| Regimental quartermaster..... | 1,800 | 1,980 | 2,160 | 2,340 | 2,520 | | | | | |
| First-lieutenant—mounted..... | 1,600 | 1,760 | 1,920 | 2,080 | 2,240 | 1,200 | 1,320 | 1,440 | 1,560 | 1,680 |
| First-lieutenant—not mounted..... | 1,500 | 1,650 | 1,800 | 1,950 | 2,100 | 1,125 | 1,237 | 1,350 | 1,462 | 1,575 |
| Second-lieutenant—mounted..... | 1,500 | 1,650 | 1,800 | 1,950 | 2,100 | 1,125 | 1,237 | 1,350 | 1,462 | 1,575 |
| Second-lieutenant—not mounted..... | 1,400 | 1,540 | 1,680 | 1,820 | 1,960 | 1,050 | 1,155 | 1,260 | 1,365 | 1,470 |
| Chaplain..... | 1,500 | 1,650 | 1,800 | 1,950 | 2,100 | 1,350 | 1,485 | 1,620 | 1,755 | 1,890 |

STATISTICS OF THE UNITED STATES ARMY, 1789-1896.

| STRENGTH OF ARMY. | | | STRENGTH OF ARMY. | | |
|-------------------|----------------------------------|--------|-------------------|--------------------------|--------|
| 1789..... | 1 reg't infantry, 1 bat. art'y.. | 840 | 1847..... | Mexican War..... | 17,812 |
| 1792..... | Indian border wars..... | 5,120 | 1848..... | "..... | 30,890 |
| 1794..... | Peace establishment..... | 3,629 | 1849-1855.. | Peace establishment..... | 10,320 |
| 1801..... | "..... | 5,144 | 1856-1861.. | "..... | 12,931 |
| 1807..... | "..... | 3,278 | 1862..... | Civil war..... | 39,273 |
| 1810..... | "..... | 7,154 | 1863-1866.. | "..... | 43,332 |
| 1812..... | War with Great Britain..... | 11,831 | 1867..... | Peace establishment..... | 54,641 |
| 1815..... | "..... | 9,413 | 1868-1869.. | "..... | 52,922 |
| 1817-1821.. | Peace establishment..... | 9,980 | 1870..... | "..... | 37,313 |
| 1822-1832.. | "..... | 6,184 | 1871..... | "..... | 35,353 |
| 1833-1837.. | "..... | 7,198 | 1872-1874.. | "..... | 32,264 |
| 1838-1842.. | Florida war..... | 12,539 | 1875-1879.. | "..... | 27,489 |
| 1843-1846.. | Peace establishment..... | 8,613 | 1891..... | "..... | 27,390 |
| | | | 1896..... | "..... | 26,955 |

The following table gives the names of those generals who have been in command of the army of the United States since the founding of the Republic.

| | From | To | | From | To | | From | To |
|-----------------------|------|------|------------------------|------|------|-----------------------|------|------|
| George Washington* | 1775 | 1783 | James Wilkinson†... | 1800 | 1812 | Henry W. Halleck* | 1862 | 1864 |
| Henry Knox* | 1783 | 1784 | Henry Dearborn* | 1812 | 1815 | Ulysses S. Grant†... | 1864 | 1869 |
| Josiah Harmer.. | 1788 | 1791 | Jacob Brown* | 1815 | 1828 | William T. Sherman.. | 1869 | 1883 |
| Arthur St. Clair* | 1791 | 1796 | Alexander Macomb* | 1828 | 1841 | Philip H. Sheridan* | 1883 | 1888 |
| James Wilkinson* | 1796 | 1798 | Winfield Scott* | 1841 | 1861 | John M. Schofield**.. | 1888 | 1895 |
| George Washington†... | 1798 | 1799 | George B. McClellan*.. | 1861 | 1862 | Nelson A. Miles..... | 1895 | .... |

* Rank of Major-General. † General. ‡ Brigadier-General. Josiah Harmer was a Lieutenant-Colonel and General-in-Chief by brevet. ** Lieutenant-General.

NAVY OF THE UNITED STATES.—The Americans were a maritime people from the time of the first settlement of the colonies; and, as maritime commerce was conducted in the seventeenth century in the midst of constant danger from pirates, Indians, and freebooters, all vessels sailing out of American ports were armed, while most of the colonies fitted out special armed vessels for the general protection. In 1690 the Massachusetts colony fitted out eight armed vessels against the French privateers of Acadia; and in the same year a squadron of 40 vessels, with 2000 men, also from Massachusetts, made an unsuccessful descent on Quebec. The beginning of the eighteenth century, and the occurrence of the French war, brought the American colonies into hostilities, and, the crown and colonies acting together, expeditions were fitted out against the French, and a considerable American navy temporarily organized. After the peace of Utrecht in 1713, this force was reduced to a few armed vessels employed to guard the coast. In 1739 England declared war against Spain, and many expeditions were fitted out in the colonies, notably that against Carthage. In 1741 a similar enterprise was undertaken against Cuba, and four years later the expedition against Louisburg, in aid of the new British war against France. In this war there were as many as 400 privateers and letters-of-marque engaged on the part of the colonies. The French and English war of 1756 again involved the colonies, and numerous brilliant naval exploits on the part of the colonial navy are recorded in its history. After the peace of 1763, no further call for armed vessels was made on the colonies, until the breaking out of the war of the revolution. At this period (1775) there existed no naval force whatever in the American colonies; and although Massachusetts fitted out a few privateers at the beginning of hostilities, it was not until six months after the battle of Lexington that Congress took steps to organize a navy. Two small cruisers were equipped to intercept British supply ships; then two more, of a larger class; and by the close of the year the construction of about 20 cruisers had been authorized. The first ensign displayed by a regular American man-of-war was hoisted by John Paul Jones, in Dec., 1775, on board the *Alfred*, of which he was first-lieutenant, that ship then lying in the Delaware. It is believed that this flag contained the device of a pine-tree, with a rattlesnake at its root, about to strike, and the motto "Don't tread on me!" The present national ensign did not come into use until 1777, and is generally believed to have originated in the arms of the Washington family, as displayed on Gen. Washington's headquarters' flag. The first American squadron consisted of eight vessels, including the *Alfred*, and sailed on Feb. 17, 1776, on a cruise against the British naval force then ravaging the coast of Virginia. This cruise was unsuccessful, and the officer in command, Commodore Ezekiel Hopkins, was dismissed from the service. Paul Jones, who was promoted to command of the *Providence*, 12 guns, atoned for this ill-fortune, in a measure, by capturing 16 prizes in a single cruise. After the Declaration of Independence, Congress set vigorously to work to construct a navy, authorizing in 1776-77 the building of 7 frigates, 2 cutters, 2 sloops-of-war, and three 74-gun ships. At the same time congress regulated the rank of the different officers, and 24 captains were appointed to take precedence as their names stood on the list. The new navy did good work; not only as coasters, and upon the high seas, but by descents on the coasts of the British isles. The bold expedition of Paul Jones, with a squadron of which the *Bon Homme Richard* was the flagship, is historical. Meanwhile armed flotillas did good service on the great lakes, as to which brilliant exploits are recorded. On the ocean no less than 342 vessels were captured from the British during the first year of the war. During the second year they lost 467 merchantmen, captured by American cruisers and privateers. In 1779 the American navy encountered many disasters; and the three last years of the war witnessed no important naval engagements. The determination of the British government to exchange no more prisoners captured in American privateers demoralized that system of naval warfare, and but a few of that class of vessels remained, while the continental navy became greatly diminished. It is, however, the fact that British shipping suffered more heavily in this contest than in any other war in which England had previously been engaged. After the peace of 1783, what few public cruisers remained to the Americans were sold by order of the government. But about 1794 difficulties having broken out with the Barbary States, Congress authorized the construction of 6 frigates, and these were speedily built, including the *United States* and the immortal *Constitution*. In 1798 anxiety regarding the apparently impending war with France induced the American government to build 20 small armed vessels; and in this year the Department of the Navy was created, Benjamin Stoddart being its first secretary. Other ships were ordered, and on July 11, 1798, the formation of the marine corps was authorized. Before the close of this year 23 American men-of-war were at sea; and the capture of the French frigate *L'Insurgente* by the *Constellation* aroused the greatest enthusiasm: this was the first occasion since the establishment of the federal navy, when a national vessel had subdued one of equal force. In the beginning of 1800 the American government had a navy of 34 men-of-war at sea. Early in the following year peace with France was declared, and at once the government proceeded to sell the greater number of these ships—from a very mistaken theory of necessary economy. Hostilities with Tripoli began soon after the amicable settlement with France, and a squadron under Commodore Dale blockaded Tripoli, and captured several neutrals attempting to enter that port. Hostilities were not concluded until the summer of 1805, many important

captures having been in the mean time effected; the town of Tripoli bombarded and nearly captured; and good work having been accomplished in awakening the *esprit de corps* which has characterized the American navy ever since. From this period until 1812, the duty of American ships-of-war was confined chiefly to guarding the coast. In the latter year broke out the war with England, the American navy then consisting of but 17 efficient vessels, of which only 8 were frigates. The splendid capture of the British frigate *Guerriere* by the *Constitution* on Aug. 19, 1812, awakened renewed enthusiasm, however; and this was followed by that of the *Phœnix* by the American sloop *Wasp*, and by the American frigate *United States* capturing the British frigate *Macedonian*—three most spirited and well-matched encounters. Early in 1813 Congress ordered the building of 4 ships of the line and 6 frigates, to be immediately followed by the construction of 6 sloops-of-war; only the sloops, however, were completed in time to be of service in this war. The general success of the Americans on the sea during the war of 1812 was equalled by the occurrence of splendid victories on Lake Erie and Lake Champlain; and the reputation of the American navy was greatly increased, while that of the British was correspondingly diminished. This war was followed by a brief period of hostilities against Algiers; and from that time to the outbreak of the Mexican war, America was at peace with all the world. Meanwhile its navy was kept in a condition of efficiency; four squadrons were retained in the Mediterranean, Pacific, on the coast of Brazil, and in the West Indies; and in 1841 a home squadron was created to cruise on the coast of the United States. By this means the dignity of the nation was for a time maintained in every part of the world, and American commerce everywhere protected. The Wilkes government exploring expedition formed an incident of this period, which raised the United States to the front rank among nations which devoted their naval resources in time of peace to scientific investigation.

The war with Mexico, which broke out in 1846, at once proved the value of the more recent system of keeping American squadrons on service in the different waters. The squadron in the gulf proceeded to blockade Vera Cruz; while that in the Pacific was ordered to the California coast and seized Monterey and Los Angeles. At Vera Cruz the navy now kept up an incessant bombardment of the fort of San Juan de Ulloa, which was eventually captured; there was no other important use made of the navy in this war. The Japan expedition under the command of Com. Perry, which was sent out by the government in 1852, was an important event in connection with opening up the ports of that country to western commerce, and its court to western diplomacy. The outbreak of the civil war found the American navy scattered far abroad, and of practically little value had it been attainable, owing to the peculiar nature of the warfare in which the north and south were now about to be engaged. The character of naval warfare had long before this totally changed. The great improvements in ordnance and projectiles had rendered the old wooden ships useless; and the application of steam power to the navy had been accomplished. But the American steam frigates were incompetent to resist the force of the Whitworth and other modern guns of long range and heavy calibre. The emergency brought forth the necessary inventive faculty, whose expression in the turreted iron-clad was the means of saving the north from ignominious failure at a most desperate moment. The operations of the United States navy during the civil war will be found fully set forth under the title REBELLION.

The following table gives a list of all vessels in the U. S. navy, with details of their construction and condition, on Jan. 1, 1897.

| NAME. | Displacement (tons). | TYPE. | Hull. | I. H. P. | Propul- sion. | Guns (Main Battery). |
|---------------------|-------------------------|--------------------------------------------------|-------|----------|------------------|----------------------------|
| FIRST RATE. | | | | | | |
| Indiana..... | 10,288 | 1st class battle-ship..... | S. | 9,738 | T. S. | 16 |
| Massachusetts..... | 10,288 | “ “ “..... | S. | 10,403 | T. S. | 16 |
| Oregon..... | 10,288 | “ “ “..... | S. | 11,111 | T. S. | 16 |
| Brooklyn..... | 9,271 | Armored cruiser..... | S. | 18,769 | T. S. | 20 |
| New York..... | 8,200 | “ “ “..... | S. | 17,401 | T. S. | 18 |
| Columbia..... | 7,375 | Protected cruiser..... | S. | 18,509 | TR. S. | 11 |
| Minneapolis..... | 7,375 | “ “ “..... | S. | 20,862 | TR. S. | 11 |
| Maine..... | 6,682 | 2d class battle-ship..... | S. | 9,293 | T. S. | 10 |
| Texas..... | 6,315 | “ “ “..... | S. | 8,600 | T. S. | 8 |
| Puritan..... | 6,060 | Double turret monitor..... | I. | 3,700 | T. S. | 10 |
| Olympia..... | 5,870 | Protected cruiser..... | S. | 17,313 | T. S. | 14 |
| SECOND RATE. | | | | | | |
| Chicago..... | 4,500 | Partially prot. cruiser..... | S. | 9,000 | T. S. | 18 |
| Baltimore..... | 4,413 | Protected cruiser..... | S. | 10,064 | T. S. | 10 |
| Philadelphia..... | 4,324 | “ “ “..... | S. | 8,815 | T. S. | 12 |
| Monterey..... | 4,084 | Barbette turret, low free- board monitor..... | S. | 5,244 | T. S. | 4 |
| Newark..... | 4,098 | Protected cruiser..... | S. | 8,869 | T. S. | 12 |
| San Francisco..... | 4,098 | “ “ “..... | S. | 9,913 | T. S. | 12 |
| Charleston..... | 3,730 | “ “ “..... | S. | 6,666 | T. S. | 8 |
| Miantonomah..... | 3,990 | Double turret monitor..... | I. | 1,426 | T. S. | 4 |
| Amphitrite..... | 3,990 | “ “ “..... | I. | 1,600 | T. S. | 6 |
| Monadnock..... | 3,990 | “ “ “..... | I. | 3,000 | T. S. | 6 |
| Terror..... | 3,990 | “ “ “..... | I. | 1,600 | T. S. | 4 |
| Launcester..... | 3,250 | Cruiser..... | W. | 1,000 | S. | 12 |

| NAME. | Displacement (tons). | TYPE. | Hull. | I. H. P. | Propul- sion. | Guns (Main Battery). |
|-------------------------------|-------------------------|------------------------------|-------|----------|------------------|----------------------------|
| SECOND RATE—continued. | | | | | | |
| Cincinnati..... | 3,213 | Protected cruiser..... | S. | 10,000 | T. S. | 11 |
| Raleigh..... | 3,213 | “ “ “..... | S. | 10,000 | T. S. | 11 |
| Atlanta..... | 3,000 | Partially prot. cruiser..... | S. | 4,030 | S. | 8 |
| Boston..... | 3,000 | “ “ “..... | S. | 4,030 | S. | 8 |
| THIRD RATE. | | | | | | |
| Hartford..... | 2,790 | Cruiser..... | W. | 2,000 | S. | 13 |
| Katahdin..... | 2,155 | Harbor defense ram..... | S. | 5,068 | T. S. | ..... |
| Ajax..... | 2,100 | Single turret monitor..... | I. | 340 | S. | 2 |
| Canonicus..... | 2,100 | “ “ “..... | I. | 340 | S. | 2 |
| Mahopac..... | 2,100 | “ “ “..... | I. | 340 | S. | 2 |
| Manhattan..... | 2,100 | “ “ “..... | I. | 340 | S. | 2 |
| Wyandotte..... | 2,100 | “ “ “..... | I. | 340 | S. | 2 |
| Detroit..... | 2,089 | Cruiser..... | S. | 5,227 | T. S. | 8 |
| Montgomery..... | 2,089 | “..... | S. | 5,280 | T. S. | 10 |
| Marblehead..... | 2,089 | “..... | S. | 5,451 | T. S. | 9 |
| Marion..... | 1,900 | “..... | W. | 1,100 | S. | 8 |
| Mohican..... | 1,900 | “..... | W. | 1,100 | S. | 10 |
| Comanche..... | 1,875 | Single turret monitor..... | I. | 340 | S. | 2 |
| Catskill..... | 1,875 | “ “ “..... | I. | 340 | S. | 2 |
| Jason..... | 1,875 | “ “ “..... | I. | 340 | S. | 2 |
| Lehigh..... | 1,875 | “ “ “..... | I. | 340 | S. | 2 |
| Montauk..... | 1,875 | “ “ “..... | I. | 340 | S. | 2 |
| Nahant..... | 1,875 | “ “ “..... | I. | 340 | S. | 2 |
| Nantucket..... | 1,875 | “ “ “..... | I. | 340 | S. | 2 |
| Passaic..... | 1,875 | “ “ “..... | I. | 340 | S. | 2 |
| Bennington..... | 1,710 | Gunboat..... | S. | 3,436 | T. S. | 6 |
| Concord..... | 1,710 | “..... | S. | 3,405 | T. S. | 6 |
| Yorktown..... | 1,710 | “..... | S. | 3,392 | T. S. | 6 |
| Dolphin..... | 1,486 | Dispatch boat..... | S. | 2,253 | S. | 2 |
| Adams..... | 1,375 | Cruiser..... | W. | 800 | S. | 6 |
| Alliance..... | 1,375 | “..... | W. | 800 | S. | 6 |
| Essex..... | 1,375 | “..... | W. | 800 | S. | 6 |
| Enterprise..... | 1,375 | “..... | W. | 800 | S. | 4 |
| Monocacy..... | 1,370 | “..... | I. | 850 | P. | 6 |
| Thetis..... | 1,250 | “..... | W. | 350 | S. | ..... |
| Castine..... | 1,177 | Gunboat..... | S. | 2,199 | T. S. | 8 |
| Machias..... | 1,177 | “..... | S. | 2,046 | T. S. | 8 |
| Alert..... | 1,020 | Cruiser..... | I. | 500 | S. | 3 |
| Ranger..... | 1,020 | “..... | I. | 500 | S. | 4 |
| FOURTH RATE. | | | | | | |
| Vesuvius..... | 929 | Dynamite-gun vessel..... | S. | 3,795 | T. S. | 3 |
| Yantic..... | 900 | Cruiser..... | W. | 310 | S. | 4 |
| Petrel..... | 892 | Gunboat..... | S. | 1,095 | S. | 4 |
| Fern..... | 840 | Transport..... | W. | ..... | ..... | ..... |
| Bancroft..... | 839 | Gunboat..... | S. | 1,213 | T. S. | 4 |
| Michigan..... | 685 | Cruiser..... | I. | 365 | P. | 4 |
| Pinta..... | 550 | Gunboat..... | I. | 310 | S. | ..... |
| TORPEDO BOATS. | | | | | | |
| Alarm..... | 800 | Torpedo ram..... | I. | 600 | M. P. | ..... |
| Ericsson..... | 120 | Torpedo boat..... | S. | 1,800 | T. S. | *3 |
| Cushing..... | 105 | “ “..... | S. | 1,720 | T. S. | *3 |
| Stiletto..... | 31 | “ “..... | W. | 359 | S. | ..... |
| TUGS. | | | | | | |
| Fortune..... | 450 | Tug..... | I. | 340 | S. | ..... |
| Iwana..... | 192 | “..... | S. | 300 | S. | ..... |
| Leyden..... | 450 | “..... | I. | 340 | S. | ..... |
| Narkeeta..... | 192 | “..... | S. | 300 | S. | ..... |
| Nina..... | 357 | “..... | I. | 388 | S. | ..... |
| Rocket..... | 187 | “..... | W. | 147 | S. | ..... |
| Standish..... | 450 | “..... | I. | 340 | S. | ..... |
| Traffic..... | 280 | “..... | W. | ..... | S. | ..... |
| Triton..... | 212 | “..... | S. | 300 | S. | ..... |
| Wahueta..... | 192 | “..... | S. | 300 | S. | ..... |
| Unadilla..... | 345 | “..... | S. | 500 | S. | ..... |
| SAILING SHIPS. | | | | | | |
| Monongahela..... | 2,100 | ..... | W. | ..... | Sails. | 4 |
| Constellation..... | 1,186 | ..... | W. | ..... | “ | 8 |
| Jamestown..... | 1,150 | ..... | W. | ..... | “ | ..... |
| Portsmouth..... | 1,125 | ..... | W. | ..... | “ | 12 |
| Saratoga..... | 1,025 | ..... | W. | ..... | “ | ..... |
| St. Mary's..... | 1,025 | ..... | W. | ..... | “ | ..... |
| RECEIVING SHIPS. | | | | | | |
| Franklin..... | 5,170 | ..... | W. | 1,050 | S. | 4 |
| Wabash..... | 4,650 | ..... | W. | 950 | S. | ..... |
| Vermont..... | 4,150 | ..... | W. | ..... | Sails. | 1 |
| Independence..... | 3,270 | ..... | W. | ..... | “ | 6 |
| Richmond..... | 2,700 | ..... | W. | 692 | S. | 14 |
| UNSERVICEABLE. | | | | | | |
| New Hampshire..... | 4,150 | Sailing ship..... | W. | ..... | Sails. | ..... |
| Pensacola..... | 3,000 | Cruiser..... | W. | 680 | S. | ..... |

| NAME. | Displacement (tons). | TYPE. | Hull. | I. H. P. | Propul- sion. | Guns (Main Battery). |
|-----------------------------------|-------------------------|----------------------------|-------|----------|------------------|----------------------------|
| UNSERVICEABLE — continued. | | | | | | |
| Omaha..... | 2,400 | Cruiser..... | W. | 953 | S. | ..... |
| Constitution..... | 2,200 | ..... | W. | ..... | Sails. | 4 |
| Iroquois..... | 1,575 | Cruiser..... | W. | 1,202 | S. | ..... |
| Nipsic..... | 1,375 | ..... | W. | 839 | S. | ..... |
| St. Louis..... | 830 | Sailing ship..... | W. | ..... | Sails. | ..... |
| Dale..... | 675 | ..... | W. | ..... | " | ..... |
| Minnesota..... | 4,700 | Cruiser..... | W. | 1,000 | S. | 9 |
| UNDER CONSTRUCTION. | | | | | | |
| Kearsarge..... | 11,525 | 1st class battle-ship..... | S. | 10,000 | T. S. | 22 |
| Kentucky..... | 11,525 | " "..... | S. | 10,000 | T. S. | 22 |
| Illinois..... | 11,525 | " "..... | S. | 10,000 | T. S. | 18 |
| Alabama..... | 11,525 | " "..... | S. | 10,000 | T. S. | 18 |
| Wisconsin..... | 11,525 | " "..... | S. | 10,000 | T. S. | 18 |
| Iowa..... | 11,410 | " "..... | S. | 11,000 | T. S. | 18 |
| Nashville..... | 1,371 | Light-draft gunboat..... | S. | 1,750 | T. S. | 8 |
| Wilmington..... | 1,392 | " "..... | S. | 1,600 | T. S. | 8 |
| Helena..... | 1,392 | " "..... | S. | 1,600 | T. S. | 8 |
| Annapolis..... | 1,000 | Composite gunboat..... | comp. | 800 | S. | 6 |
| Vicksburg..... | 1,000 | " "..... | " | 800 | S. | 6 |
| Newport..... | 1,000 | " "..... | " | 800 | S. | 6 |
| Princeton..... | 1,000 | " "..... | " | 800 | S. | 6 |
| Wheeling..... | 1,000 | " "..... | " | 800 | T. S. | 6 |
| Marietta..... | 1,000 | " "..... | " | 800 | T. S. | 6 |
| Torpedo boat No. 3..... | 142 | Torpedo boat..... | S. | 2,000 | T. S. | *3 |
| " " " 4..... | 142 | " "..... | S. | 2,000 | T. S. | *3 |
| " " " 5..... | 142 | " "..... | S. | 2,000 | T. S. | *3 |
| " " " 6..... | ..... | " "..... | S. | ..... | T. S. | *3 |
| " " " 7..... | ..... | " "..... | S. | ..... | T. S. | *3 |
| " " " 8..... | 182 | " "..... | S. | 3,200 | T. S. | *3 |
| " " " 9..... | 146 | " "..... | S. | 4,200 | T. S. | *3 |
| " " " 10..... | 146 | " "..... | S. | 4,200 | T. S. | *3 |
| " " " 11..... | 273 | " "..... | S. | 5,600 | T. S. | *2 |
| " " " 12..... | 128 | " "..... | S. | 1,750 | T. S. | *4 |
| " " " 13..... | 128 | " "..... | S. | 1,750 | T. S. | *4 |
| " " " 14..... | 103 | " "..... | S. | 1,750 | T. S. | *3 |
| " " " 15..... | 464 | " "..... | S. | 850 | S. | *2 |
| " " " 16..... | 464 | " "..... | S. | 850 | S. | *2 |
| " " " 17..... | 65 | " "..... | S. | 850 | S. | *2 |
| " " " 18..... | 65 | " "..... | S. | 850 | S. | *2 |
| Submarine torpedo boat..... | 168 | " "..... | S. | 1,200 | T. S. | *2 |
| Tug No. 5..... | 225 | Tug..... | S. | 400 | S. | ..... |

EXPLANATION.—* Torpedo tubes. *Hull*: S., steel; I., iron; W., wood. *Propulsion*: S., screw; T. S., twin screw; Tr. S., triple screw; P., paddle; M. P., Mallory propeller.

During the first ten months of 1897, twelve new vessels were added to those in commission, viz.: the battleship *Iowa*; the gunboats *Nashville*, *Wilmington*, *Helena*, *Annapolis*, *Vicksburg*, *Newport*, *Wheeling*, and *Marietta*; and the torpedo boats *Foote*, *Porter*, and *Dupont* (the last indicated in the table by numerals).

The United States Navy was commanded in 1896 by 6 rear-admirals, 10 commodores, 45 captains, 85 commanders and 74 lieutenant-commanders, 250 lieutenants, 75 lieutenants, junior grade, and 167 ensigns.

PAY OF THE NAVY OF THE UNITED STATES.

| RANK. | At Sea. | On Shore Duty. | On Leave or Waiting Orders. |
|--------------------------------------------------------------------------------------------------------------------|-------------------|-------------------|-----------------------------------|
| Rear-Admirals..... | \$6,000 | \$5,000 | \$4,000 |
| Commodores..... | 5,000 | 4,000 | 3,000 |
| Captains..... | 4,500 | 3,500 | 2,800 |
| Commanders..... | 3,500 | 3,000 | 2,300 |
| Lieutenant-Commanders: | | | |
| First four years after date of commission..... | 2,800 | 2,400 | 2,000 |
| After four years from date of commission..... | 3,000 | 2,600 | 2,200 |
| Lieutenants: | | | |
| First five years after date of commission..... | 2,400 | 2,000 | 1,600 |
| After five years from date of commission..... | 2,600 | 2,200 | 1,800 |
| Lieutenants (Junior Grade): | | | |
| First five years after date of commission..... | 1,800 | 1,500 | 1,200 |
| After five years from date of commission..... | 2,000 | 1,700 | 1,400 |
| Ensigns: | | | |
| First five years after date of commission..... | 1,200 | 1,000 | 800 |
| After five years from date of commission..... | 1,400 | 1,200 | 1,000 |
| Naval Cadets..... | 500 | 500 | 500 |
| Mates..... | 1,200 | 900 | 700 |
| Medical and Pay Directors and Medical and Pay Inspectors and Chief Engi- neers having the same rank at sea..... | 4,400 | ..... | ..... |
| Fleet-Surgeons, Fleet-Paymasters and Fleet-Engineers..... | 4,440 | ..... | ..... |
| Surgeons, Paymasters and Chief Engineers..... | 2,800 to 4,200 | 2,400 to 4,000 | 2,000 to 3,000 |
| Chaplains..... | 2,500 to 2,800 | 2,000 to 2,300 | 1,600 to 1,900 |

Warrant officers are paid from \$700 to \$1800, and seamen \$228 to \$298 per annum.

The United States have navy yards, at Brooklyn, N. Y., Boston, Mass. (Charlestown), Norfolk, Va. (Gosport), Portsmouth, N. H. (Kittery), League Island (near Philadelphia), Mare Island (near San Francisco), Pensacola, Fla., and Washington, D. C. There are naval stations at Newport, R. I., New London, Conn., Port Royal, S. C., Key West, Fla., and Bremerton, Wash.; besides torpedo and training stations and a Naval War College at Newport, R. I.

Officers of the navy are retired from active service after sixty-two years of age, or may be retired after forty years' service, irrespective of age (except in certain grades). The pay of retired naval officers is 75 per cent. of the sea-pay of the rank held at the time of retirement.

In 1897 a naval militia was maintained in fifteen states, under federal aid. See NAVAL RESERVE.

EDUCATION.—Education is general in the United States, every possible effort being made to aid in its diffusion. Such illiteracy as exists is chiefly to be found (1) among the blacks of the south and (2) among the immigrants who form a comparatively large proportion of the inhabitants. In 1895 the population from 6 to 14 years of age was estimated at 20,328,147. The public school enrollment was 14,201,752; average attendance, 9,387,507; teachers, 396,327; school-houses, 237,416; estimated value of public school property, \$439,071,690; total revenue, \$177,597,691; total expenditure, \$178,215,556, of which \$113,664,874 was for salaries of teachers and superintendents. The enrollment in private schools was estimated at 1,211,220, making a total enrollment of 15,412,972. There were 4712 public high schools, with 14,122 teachers and 1,264,464 pupils; 2180 private secondary schools, with 8559 teachers, 232,225 elementary and secondary pupils, 1,637,127 volumes in the libraries, and grounds, buildings, and apparatus valued at \$51,865,512; 155 public normal schools, with 57,704 students; 201 private normal schools, with 54,076 students; 138 colleges, exclusively for men, with 22,503 students; 343 co-educational colleges, with 27,222 male and 13,552 female students; and 163 colleges exclusively for women.

The United States government makes no direct appropriations for the maintenance of the public schools, but has set aside for this purpose land in several of the newer states, the proceeds from the sale of which form a part of the permanent school fund, the income alone being used for the support of the schools. This income is supplemented by direct taxation in the separate states, or by local taxation in the towns, or by both.

Professional schools are numerous. All the great universities have departments of law and medicine, and separate schools for the study of each of these professions exist. In 1895 there were 151 medical schools in the United States, of which 20 were devoted to homoeopathy, and 72 schools of law. The United States government maintains a military academy at West Point and a naval academy at Annapolis. There are also a large number of schools for the education of Indian children; the most famous being those at Hampton, Va., and Carlisle, Pa.

In 1896 there were 4026 public, society, and school libraries of 1000 volumes each and upward, containing an aggregate of 33,051,872 bound volumes, and 5,444,788 pamphlets. There were 34 that contained upward of 100,000 volumes each. (See LIBRARIES.) The periodicals reported in 1897 aggregated 20,569, of which 2070 were daily, 14,673 weekly, and 2786 monthly publications. See AMERICAN JOURNALISM; NEWSPAPER.

RELIGION.—The Constitution guarantees the free exercise of religious profession and worship—a guarantee that each of the states repeats in its own constitution. The census of 1890 reported the existence of 143 distinct denominations, besides many independent and unassociated churches. The order of denominational families, according to number of communicants, was Catholic, 6,257,871; Methodist, 4,589,264; Baptist, 3,712,468; Presbyterian, 1,278,332; Lutheran, 1,231,072; Episcopalian, 540,509; all others, below 400,000. There were in all 165,177 organizations; 142,521 church edifices; 23,324 halls used for religious purposes; 20,612,806 communicants; and church property valued at \$679,630,139.

PAUPERISM AND CRIME.—The census of 1890 gave the number of paupers in the almshouses of the different states as 73,045 against 66,203 in 1880, an increase of 6842. Of these 40,741 were males and 32,304 females. The negro paupers numbered 6467; the paupers of foreign birth, 36,656. Besides the inmates of almshouses, there were reported to be 24,220 "out-door paupers," but these figures are confessedly incomplete.

In the year 1890, there were in the different penitentiaries of the United States, 45,233 convicts as against 35,538 in 1880, an increase of 9695. The ratio of convicts to population in 1880 was 709 in 1,000,000. In 1890 the ratio was 722 in 1,000,000. Of the convicts in 1890, 7267 were of foreign birth, and 14,687 were colored. The census gives the relative numbers of native-born and foreign-born criminals. It attributes 57 per cent. of the crimes committed by whites to the foreign-born and 43 per cent. to native-born. The number of foreign-born prisoners per 1,000,000 was 1,822.43; and of native-born prisoners per 1,000,000, 882.45; of foreign-born and those of foreign parentage, 1523.06 per 1,000,000; and of native-born whites of native parentage, 753.7 per 1,000,000. It must be borne in mind, however, that a heavier percentage of crime would naturally be expected among the foreign-born on account of the far greater proportion of adults among them. Only 1791 were women. See PRISONS.

INTERNAL COMMUNICATIONS.—The growth of the railway system of the United States dates from 1827, when the first line was opened for traffic at Quincy, Massachusetts. The extent of railways in operation in 1830 was 23 miles; it rose to 2818 miles in 1840; to 9021 miles in 1850; to 30,635 miles in 1860; to 53,399 miles in 1870; to 84,393 miles in 1880; and to 166,702 in 1890. The subsequent construction was, 1891, 4281 miles; 1892, 4192; 1893, 2635; 1894, 1949; 1895, 1803; 1896, 1802—making in the last year, approximately, 183,364 miles. Each of several authorities on railroad statistics has a different method or time of computation, consequently no two agree on total results. The capital stock of all corporations exceeds \$5,180,000,000; funded debt, \$5,640,000,000; total investment, \$11,240,000,000; cost of roads and equipments, \$9,860,000,000; gross earnings, \$1,093,000,000; net earnings, \$323,000,000; interest paid on bonds, \$239,000,000; and dividends paid on stocks, \$81,000,000. See RAILWAYS.

The telegraphs of the United States are almost entirely in the hands of the Western Union Telegraph Company, which had in 1896, 189,918 miles of poles and cables, 826,929 miles of wire, and 21,725 offices; the number of messages sent was 58,760,444, the receipts, \$22,612,736, and profits, \$5,897,980. In 1896 there were 459,728 miles of telephonic wire belonging to one company, with 927 exchanges, 686 branch offices, 281,695 subscribers, and 674,976 telephone instruments in use. The average of daily exchange connections was 2,351,420.

The canal system of the United States is very important and susceptible in the future of a much fuller development. The first canal in America was built in 1793 around the falls of the Connecticut river. The principal canals are now the Erie Canal (352 miles in length) from Albany to Buffalo; the Louisville and Portland, the Delaware and Raritan, the Morris, the Illinois and Michigan, the Chesapeake and Delaware, the Ohio, the Delaware and Hudson, the Albemarle and Chesapeake, the Champlain, the Miami and Erie, the Schuylkill, and the Sault Ste. Marie. Since 1880 a large number of canals has been abandoned, as no longer profitable, because of the development of railroads; and nearly all of those constructed since that day are of the character known as ship canals. See CANALS.

SHIPPING AND NAVIGATION. The shipping belonging to the United States on June 30, 1897, aggregated 22,633 vessels, of 4,769,020 gross tons, of which 2,647,796 tons were registered at Atlantic and gulf ports, and 1,410,103 tons at ports on the great lakes. The steam tonnage amounted to 2,358,558 gross tons (6599 vessels), the largest ever reported. During the fiscal year 1896-7, there were 68 iron and steel vessels of 124,395 tons built and documented, making the total vessels of that character 1023, of 1,207,222 tons. The shipments of seamen aggregated 72,000, of whom 22,500 were Americans, 18,000 Scandinavians, 13,000 British, 8,000 Germans, and the remainder of other nationalities.

The foreign carrying trade of the United States, has, in fact, steadily declined so far as concerns the employment of ships with an American register. This decline began at the outbreak of the Civil War in 1861, when the privateers of the Southern Confederacy made the seas unsafe for vessels flying the United States flag; but the close of the war only slightly and for the moment checked the waning of the American carrying trade, which has steadily continued, partly, as some assert, because of unwise navigation laws. The following table shows the value of the exports and imports from and to the United States carried respectively in American and foreign vessels for each year from 1860 to 1890:

| Year ending June 30. | In Ameri- can Vessels. | In Foreign Vessels. | Percent, in American Vessels. | Year ending June 30. | In Ameri- can Vessels. | In Foreign Vessels. | Per cent. in American Vessels. |
|-------------------------|---------------------------|------------------------|-------------------------------------|-------------------------|---------------------------|------------------------|--------------------------------------|
| 1860 | \$507,247,757 | \$255,040,793 | 66.5 | 1876 | \$311,076,171 | \$813,354,987 | 33.1 |
| 1861 | 381,516,788 | 203,478,278 | 65.2 | 1877 | 316,660,281 | 859,920,536 | 26.5 |
| 1862 | 217,695,418 | 218,015,296 | 50.0 | 1878 | 313,050,966 | 876,991,129 | 25.9 |
| 1863 | 241,872,471 | 343,056,081 | 41.4 | 1879 | 272,015,692 | 811,269,232 | 22.6 |
| 1864 | 184,061,486 | 485,793,548 | 27.5 | 1880 | 258,346,577 | 1,224,265,434 | 17.18 |
| 1865 | 167,402,872 | 437,010,124 | 27.7 | 1881 | 250,586,425 | 1,269,002,983 | 16.22 |
| 1866 | 325,711,861 | 685,226,691 | 32.2 | 1882 | 227,229,745 | 1,212,978,769 | 15.40 |
| 1867 | 297,334,904 | 581,330,403 | 33.9 | 1883 | 240,420,500 | 1,258,506,924 | 15.54 |
| 1868 | 297,981,573 | 550,546,074 | 35.1 | 1884 | 233,699,035 | 1,127,798,109 | 16.60 |
| 1869 | 289,956,772 | 589,492,012 | 33.1 | 1885 | 194,865,743 | 1,079,518,566 | 14.76 |
| 1870 | 352,969,401 | 638,927,488 | 35.6 | 1886 | 197,349,503 | 1,073,911,113 | 15.01 |
| 1871 | 353,634,172 | 755,822,576 | 31.2 | 1887 | 194,356,746 | 1,165,194,508 | 13.80 |
| 1872 | 345,331,101 | 830,346,392 | 28.5 | 1888 | 190,857,473 | 1,174,697,321 | 13.44 |
| 1873 | 346,306,592 | 966,723,651 | 25.8 | 1889 | 203,805,108 | 1,219,063,541 | 13.70 |
| 1874 | 350,451,994 | 939,206,106 | 26.7 | 1890 | 202,451,086 | 1,371,116,744 | 12.29 |
| 1875 | 314,257,792 | 884,788,517 | 25.8 | | | | |

In the year ending June 30, 1897, the entrances of the merchant marine at all ports of the United States were: sailing vessels, 5,086,660 tons, steam vessels, 20,322,326 tons; and the clearances were: sailing vessels, 4,977,514, steam vessels, 20,367,990.

COMMERCE.—The commerce of the United States has steadily increased since the year 1789-90, when the total value of its exports was \$20,194,794, and of its imports \$23,000,000, down to the year 1897, when its exports were valued at \$1,032,001,300, and its imports at \$764,717,609. The appended table shows the value of articles of import and export by groups for the fiscal year ending June 30, 1897:

IMPORTS AND EXPORTS OF MERCHANDISE.

| ARTICLES. | Value. | ARTICLES. | Value. |
|----------------------------------------------------------|---------------|-------------------------------------------|----------------------|
| IMPORTS. | | IMPORTS. | |
| FREE OF DUTY: | | Articles manufactured — | |
| Articles of food and live animals..... | \$124,012,968 | For mechanic arts..... | \$87,173,512 |
| Articles in a crude condition for domestic industry..... | 194,564,418 | For consumption..... | 134,375,126 |
| Articles manufactured — | | Articles of voluntary use, luxuries, etc. | 83,098,669 |
| For mechanic arts..... | 29,864,421 | Total imports of merchandise..... | \$764,717,609 |
| For consumption..... | 24,750,275 | | |
| Articles of voluntary use, luxuries, etc. | 8,746,339 | | |
| Total free of duty..... | \$381,938,421 | DUTIES COLLECTED..... | \$176,316,893 |
| DUTIABLE: | | EXPORTS. | |
| Articles of food and live animals..... | \$121,153,211 | DOMESTIC: | |
| Articles in a crude condition for domestic industry..... | 20,339,911 | Products of — Agriculture..... | \$683,878,990 |
| Articles manufactured — | | Manufactures..... | 276,357,861 |
| For mechanic arts..... | 57,309,091 | Mining..... | 21,338,129 |
| For consumption..... | 109,624,851 | Forest..... | 40,489,321 |
| Articles of voluntary use, luxuries, etc. | 74,352,124 | Fisheries..... | 6,134,014 |
| Total dutiable..... | \$382,779,188 | Miscellaneous..... | 3,802,985 |
| | | Total..... | \$1,032,001,300 |
| FREE AND DUTIABLE: | | FOREIGN: | |
| Articles of food and live animals..... | \$245,166,179 | Free of duty..... | \$9,746,495 |
| Articles in a crude condition for domestic industry..... | 214,904,329 | Dutiable..... | 9,239,458 |
| | | Total..... | \$18,985,953 |
| GOLD AND SILVER. | | | |
| Gold—Imports..... | \$85,014,780 | Silver—Imports..... | \$30,533,227 |
| Exports..... | 40,361,580 | Exports..... | 61,946,638 |

The value of American exports and imports for each fiscal year of 1880–1897, is shown by the following table:

| YEAR ENDING JUNE 30. | EXPORTS. | | Total Exports. | Imports. | Total Imports and Exports. | Excess of Exports over Imports. | Excess of Imp'ts over Exports. |
|----------------------------|---------------|--------------|----------------|---------------|----------------------------------|---------------------------------------|--------------------------------------|
| | Domestic. | Foreign. | | | | | |
| 1880.... | \$833,294,246 | \$19,487,331 | \$852,781,577 | \$760,989,056 | \$1,613,770,633 | \$91,792,521 | ..... |
| 1881.... | 898,152,891 | 23,631,302 | 921,784,193 | 753,240,125 | 1,675,024,318 | 168,544,068 | ..... |
| 1882.... | 776,720,003 | 23,239,733 | 799,959,736 | 767,111,964 | 1,567,071,700 | 32,847,772 | ..... |
| 1883.... | 825,846,813 | 29,812,922 | 855,659,735 | 751,670,805 | 1,607,330,040 | 103,989,480 | ..... |
| 1884.... | 775,190,487 | 32,456,505 | 807,646,992 | 705,123,955 | 1,512,770,947 | 102,523,037 | ..... |
| 1885.... | 751,059,056 | 33,362,224 | 784,421,280 | 620,769,652 | 1,405,190,932 | 163,651,628 | ..... |
| 1886.... | 717,888,646 | 34,099,594 | 751,988,240 | 674,029,792 | 1,426,018,032 | 77,958,448 | ..... |
| 1887.... | 725,733,263 | 26,447,639 | 752,180,902 | 752,490,560 | 1,504,671,462 | ..... | \$309,658 |
| 1888.... | 717,057,608 | 25,311,082 | 742,368,690 | 783,295,100 | 1,525,663,790 | ..... | 40,926,410 |
| 1889.... | 810,497,603 | 28,545,305 | 839,042,908 | 774,094,725 | 1,613,137,633 | 64,948,183 | ..... |
| 1890.... | 881,076,017 | 28,901,087 | 909,977,104 | 823,286,735 | 1,733,263,839 | 86,690,369 | ..... |
| 1891.... | 872,270,283 | 12,210,527 | 884,480,810 | 844,916,196 | 1,729,397,006 | 39,564,614 | ..... |
| 1892.... | 1,015,732,011 | 14,546,137 | 1,030,278,148 | 827,402,462 | 1,857,680,610 | 202,875,686 | ..... |
| 1893.... | 831,030,785 | 16,634,409 | 847,665,194 | 866,400,922 | 1,714,066,116 | ..... | 18,755,723 |
| 1894.... | 869,204,967 | 22,935,635 | 892,140,572 | 654,994,622 | 1,547,135,194 | 237,145,950 | ..... |
| 1895.... | 793,392,599 | 14,145,566 | 807,538,165 | 731,969,965 | 1,539,508,130 | 75,568,200 | ..... |
| 1896.... | 863,200,487 | 19,406,451 | 882,606,938 | 773,724,674 | 1,662,331,612 | 102,882,264 | ..... |
| 1897.... | 1,032,001,300 | 18,985,953 | 1,050,987,253 | 764,717,609 | 1,815,704,862 | 286,269,644 | ..... |

The relative value of American trade with foreign countries is shown by the following table of exports and imports for the year ending June 30, 1897:

IMPORTS AND EXPORTS OF MERCHANDISE, BY COUNTRIES.

| COUNTRIES. | IMPORTS. | | EXPORTS. | COUNTRIES. | IMPORTS. | |
|---------------------------------|-------------|-------------|----------|--------------------------|-------------|-------------|
| | 1897. | 1897. | | | 1897. | 1897. |
| EUROPE. | Dollars. | Dollars. | | EUROPE—continued. | Dollars. | Dollars. |
| Austria-Hungary..... | 8,158,328 | 4,023,054 | | Portugal..... | 2,234,291 | 2,520,058 |
| Azores and Madeira Islands..... | 12,535 | 298,766 | | Roumania..... | ..... | 42,065 |
| Belgium..... | 14,082,414 | 33,071,555 | | Russia, Baltic, etc..... | 1,865,967 | 5,995,204 |
| Denmark..... | 356,355 | 10,194,857 | | Russia, Black Sea..... | 1,333,692 | 1,607,072 |
| France..... | 67,530,231 | 57,594,541 | | Servia..... | 12,646 | ..... |
| Germany..... | 111,211,027 | 125,246,088 | | Spain..... | 3,631,973 | 10,912,789 |
| Gibraltar..... | 26,462 | 332,245 | | Sweden and Norway..... | 2,500,118 | 5,463,597 |
| Greece..... | 732,702 | 110,763 | | Switzerland..... | 13,848,782 | 70,610 |
| Greenland, Iceland, etc..... | 40,056 | ..... |  | Turkey in Europe..... | 2,766,094 | 55,028 |
| Italy..... | 19,067,195 | 21,502,423 | | United Kingdom..... | 167,951,227 | 483,255,086 |
| Malta, Gozo, etc..... | 8,647 | 29,520 | | | | |
| Netherlands..... | 12,821,611 | 51,045,011 | | Total Europe..... | 430,193,353 | 813,380,332 |

| COUNTRIES. | IMPORTS. | EXPORTS. | COUNTRIES. | IMPORTS. | EXPORTS. |
|---------------------------------|--------------------|-------------------|-------------------------------|--------------------|----------------------|
| | 1897 | 1897 | | 1897 | 1897 |
| NORTH AMERICA. | Dollars. | Dollars. | ASIA — continued. | Dollars. | Dollars. |
| Bermuda..... | 621,831 | 854,832 | Korea..... | | 904 |
| British Honduras..... | 226,683 | 569,589 | Russia, Asiatic..... | 201,421 | 413,942 |
| British North America..... | 40,708,148 | 66,034,037 | Turkey in Asia..... | 4,009,127 | 74,899 |
| Central American States..... | 8,524,428 | 7,939,907 | All other Asia..... | 70,380 | 480,005 |
| Mexico..... | 18,511,572 | 23,421,064 | Total Asia..... | 87,295,280 | 39,268,755 |
| Miquelon, Langley, etc..... | 139,803 | 167,449 | OCEANICA. | | |
| West Indies: | | | Auckland, Fiji, etc..... | | 19,776 |
| British..... | 12,285,885 | 7,943,477 | British Australasia, etc..... | 5,900,144 | 17,460,283 |
| Danish..... | 367,289 | 521,765 | French Oceania..... | 378,144 | 330,364 |
| Dutch..... | 96,343 | 652,341 | German Oceania..... | 4,694 | 11,102 |
| French..... | 9,944 | 1,679,625 | Hawaiian Islands..... | 13,687,799 | 4,690,075 |
| Haiti..... | 1,460,220 | 3,832,388 | Spanish Oceania..... | 5,047 | |
| Santo Domingo..... | 2,369,424 | 1,098,635 | Tonga, Samoa, etc..... | 40,971 | 46,576 |
| Spanish: Cuba..... | 18,407,211 | 8,259,776 | Philippine Islands..... | 4,383,740 | 94,597 |
| Puerto Rico..... | 2,181,024 | 1,988,888 | Total Oceania..... | 24,400,439 | 22,652,773 |
| Total West Indies..... | 37,177,340 | 25,976,895 | AFRICA. | | |
| SOUTH AMERICA. | | | British Africa..... | 1,468,994 | 13,096,643 |
| Argentina..... | 10,772,627 | 6,384,984 | Canary Islands..... | 49,909 | 297,878 |
| Bolivia..... | | 7,787 | French Africa..... | 254,765 | 302,010 |
| Brazil..... | 69,039,389 | 12,450,061 | German Africa..... | 96 | 320 |
| Chile..... | 3,792,434 | 2,578,911 | Liberia..... | 7,023 | 11,443 |
| Colombia..... | 4,730,637 | 3,807,012 | Madagascar..... | 17,088 | 473,353 |
| Ecuador..... | 566,626 | 734,868 | Portuguese Africa..... | 23,253 | 1,869,133 |
| Falkland Islands..... | | 800 | Spanish Africa..... | | 4,740 |
| Guianas..... | 4,706,781 | 2,063,946 | Turkey in Africa: Egypt..... | 7,027,005 | 323,761 |
| Paraguay..... | | 740 | Tripoli..... | 119,238 | 37 |
| Peru..... | 722,089 | 1,108,436 | All other Africa..... | 562,352 | 573,009 |
| Uruguay..... | 3,515,054 | 1,213,426 | Total Africa..... | 9,529,723 | 16,953,127 |
| Venezuela..... | 9,543,572 | 3,417,522 | Grand total..... | 764,717,609 | 1,050,987,253 |
| Total South America..... | 107,389,009 | 33,768,493 | RECAPITULATION. | | |
| ASIA. | | | Europe..... | 430,193,353 | 813,380,332 |
| Aden..... | 1,503,802 | 991,397 | North America..... | 105,909,805 | 124,963,773 |
| China..... | 20,403,862 | 11,924,433 | South America..... | 107,389,009 | 33,768,493 |
| East Indies: British..... | 20,567,122 | 3,844,911 | Asia..... | 87,295,280 | 39,268,755 |
| Dutch..... | 15,604,866 | 2,094,109 | Oceania..... | 24,400,439 | 22,652,773 |
| French..... | | 135,183 | Africa..... | 9,529,723 | 16,953,127 |
| Portuguese..... | 519 | | | | |
| Hongkong..... | 924,531 | 6,053,632 | | | |
| Japan..... | 24,009,705 | 13,255,340 | | | |

AGRICULTURE, LIVE STOCK, ETC.—With an abundance of land, agriculture holds the first place in the list of national industries. The national lands are sold by the government for cash, for the most part at the ordinary price of \$1.25 per acre.

Vast quantities of land have been impoverished, exhausted, and abandoned; but improved systems of agriculture are promoted by the government, and widely introduced. Wheat and maize are grown in all the states; cotton, south of lat. 37°; sugar-cane in Louisiana, Texas, and Florida; hemp and tobacco chiefly between lat. 34° and 40°; rice, in South Carolina and Georgia; figs and oranges flourish in the Gulf States and California; and peaches, grapes, melons, and other delicious fruits are abundant and in great perfection south of lat. 43°.

GRAIN PRODUCTION OF THE UNITED STATES.

| YEAR. | Indian Corn. | Wheat. | Oats. | Barley. | Rye. | Buckwheat. |
|------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | <i>Bushels.</i> | <i>Bushels.</i> | <i>Bushels.</i> | <i>Bushels.</i> | <i>Bushels.</i> | <i>Bushels.</i> |
| 1850..... | 592,071,104 | 100,485,944 | 146,584,179 | 5,167,015 | 14,188,813 | 8,956,912 |
| 1860..... | 838,792,742 | 173,104,924 | 172,643,185 | 15,825,898 | 21,101,380 | 17,571,818 |
| 1870..... | 760,944,549 | 287,745,626 | 282,107,157 | 29,761,305 | 16,918,795 | 9,821,721 |
| 1880..... | 1,754,861,535 | 459,479,503 | 407,858,999 | 44,113,495 | 19,831,595 | 11,817,327 |
| 1885..... | 1,936,176,000 | 357,112,000 | 629,409,000 | 58,360,000 | 21,756,000 | 12,626,000 |
| 1886..... | 1,665,441,000 | 467,218,000 | 624,134,000 | 59,428,000 | 24,489,000 | 11,869,000 |
| 1887..... | 1,456,161,000 | 456,329,000 | 659,618,000 | 56,812,000 | 20,691,000 | 10,844,000 |
| 1888..... | 1,987,790,000 | 415,868,000 | 701,735,000 | 63,884,593 | 28,412,011 | 12,000,000 |
| 1889..... | 2,112,892,000 | 490,560,000 | 751,515,000 | | | |
| 1890..... | 1,489,970,000 | 399,262,000 | 523,621,000 | 68,000,000 | 28,000,000 | 11,000,000 |
| 1891..... | 2,060,154,000 | 611,780,000 | 738,394,000 | 80,000,000 | 33,000,000 | 12,000,000 |
| 1892..... | 1,628,464,000 | 515,949,000 | 661,035,000 | 72,000,000 | 30,000,000 | 11,000,000 |
| 1893..... | 1,619,496,131 | 396,131,725 | 638,854,850 | 69,869,495 | 26,555,446 | 12,132,311 |
| 1894..... | 1,212,770,052 | 460,267,416 | 662,086,928 | 61,400,465 | 26,727,615 | 12,668,200 |
| 1895..... | 2,151,139,000 | 467,103,000 | 824,444,000 | 87,373,000 | 27,210,000 | 15,341,000 |
| 1896*..... | 2,283,875,165 | 427,684,346 | 707,346,404 | 69,695,223 | 24,369,047 | 14,089,783 |

* Estimates of the U. S. Agricultural Department. The estimated value of all cereals produced in 1896 was \$972,068,888.

The production of tobacco by states for the year ending Dec. 31, 1896, is shown by the following table:

| STATES. | Pounds. | Acres. | Value. | STATES. | Pounds. | Acres. | Value. |
|-------------------|-------------|---------|-----------|-----------------------------------|-------------|---------|--------------|
| Alabama..... | 1,009,090 | 2,147 | \$161,454 | North Carolina.. | 68,629,170 | 134,567 | \$5,490,334 |
| Arkansas..... | 1,327,500 | 2,950 | 146,025 | Pennsylvania.... | 16,244,280 | 13,884 | 1,299,542 |
| Connecticut..... | 3,199,500 | 1,975 | 383,940 | Tennessee..... | 35,211,660 | 53,351 | 2,464,816 |
| Illinois..... | 2,497,280 | 3,902 | 237,242 | Virginia..... | 57,961,260 | 92,002 | 3,013,986 |
| Indiana..... | 8,130,760 | 11,907 | 365,884 | West Virginia.... | 3,685,680 | 5,119 | 313,283 |
| Kentucky..... | 143,623,850 | 196,745 | 6,032,202 | Wisconsin..... | 5,088,000 | 3,975 | 279,840 |
| Maryland..... | 9,277,100 | 15,995 | 398,915 | Other States and Territories..... | 2,437,500 | 3,750 | 341,250 |
| Massachusetts.... | 3,199,500 | 1,975 | 383,940 | Totals..... | 403,004,320 | 594,749 | \$24,253,070 |
| Missouri..... | 7,406,000 | 10,580 | 666,540 | | | | |
| New York..... | 3,389,360 | 3,259 | 271,149 | | | | |

The cotton crop for the year ending Sept. 1, 1896, was 7,162,473 bales, the average weight of a bale being 440 pounds.

The following table shows the number of hogs packed and marketed during the year ending March 1, 1890:

| CITIES. | Number of Hogs. | CITIES. | Number of Hogs. | CITIES. | Number of Hogs. |
|-------------------|-----------------|------------------------|-----------------|-------------------------|-----------------|
| Chicago..... | 4,473,467 | Milwaukee..... | 582,031 | New York Receipts.... | 3,023,035 |
| Chicago City..... | 1,708,548 | Buffalo..... | 466,167 | Philadelphia Receipts.. | |
| Boston..... | 1,140,650 | Sioux City..... | 608,514 | Baltimore Receipts.... | |
| Omaha..... | 1,052,736 | St. Paul..... | 229,498 | Total Hogs Packed | 18,906,671 |
| St. Louis..... | 739,602 | Louisville..... | 173,512 | and Marketed..... | |
| Indianapolis..... | 640,303 | Other Places West..... | 2,799,536 | | |
| Cincinnati..... | 464,556 | Other Places East..... | 731,516 | | |

Gross weight, 4,491,053,000 pounds; green meats, all kinds, 2,514,990,000 pounds; lard, 623,727,000 pounds.

The following is a tabular statement showing the number of acres of public lands surveyed in the land States and Territories up to June 30, 1895; also the total area of the public domain remaining unsurveyed within the same:

| LANDS, STATES, AND TERRITORIES. | Acres. | Square Miles. | Number of Acres of Public Land Surveyed up to June 30, 1895. | Total Area of Public and Indian Lands Remaining Unserved, Including the Area of Private Land Claims. |
|---------------------------------|---------------|---------------|--------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| Alabama..... | 32,462,115 | 50,722 | 32,462,115 | ..... |
| Arkansas..... | 33,410,063 | 52,203 | 33,410,063 | ..... |
| California..... | 100,992,640 | 157,801 | 73,652,172 | 26,027,702 |
| Colorado..... | 66,880,000 | 104,500 | 61,186,201 | 5,664,619 |
| Florida..... | 37,931,520 | 59,268 | 30,830,668 | 7,100,391 |
| Illinois..... | 35,465,093 | 55,414 | 35,465,093 | ..... |
| Indiana..... | 21,637,760 | 33,809 | 21,637,760 | ..... |
| Iowa..... | 35,228,800 | 55,045 | 35,228,800 | ..... |
| Idaho..... | 55,228,100 | 86,294 | 13,980,946 | 40,687,257 |
| Kansas..... | 51,770,240 | 80,891 | 51,770,240 | ..... |
| Louisiana..... | 28,731,090 | 44,893 | 27,174,005 | 1,557,085 |
| Michigan..... | 36,128,640 | 56,451 | 36,128,640 | ..... |
| Minnesota..... | 53,459,840 | 83,531 | 45,916,148 | 7,310,411 |
| Mississippi..... | 30,179,840 | 47,156 | 30,179,840 | ..... |
| Missouri..... | 41,836,931 | 65,370 | 41,836,931 | ..... |
| Montana..... | 92,016,640 | 143,776 | 25,462,040 | 64,072,969 |
| Nebraska..... | 47,468,800 | 74,170 | 47,256,619 | 212,038 |
| Nevada..... | 71,737,600 | 112,090 | 35,026,574 | 36,003,635 |
| North Dakota..... | 45,561,600 | 71,190 | 30,862,190 | 13,910,976 |
| Ohio..... | 25,581,976 | 39,972 | 25,581,976 | ..... |
| Oregon..... | 60,975,360 | 95,274 | 42,843,672 | 17,757,019 |
| South Dakota..... | 50,643,200 | 79,130 | 37,753,506 | 11,918,877 |
| Wisconsin..... | 34,511,360 | 53,924 | 34,511,360 | ..... |
| Washington..... | 44,796,160 | 69,994 | 24,230,752 | 19,993,394 |
| Wyoming..... | 62,645,120 | 97,883 | 51,050,358 | 17,327,737 |
| Alaska..... | 369,529,600 | 577,390 | 598 | 369,528,615 |
| Arizona..... | 72,906,240 | 113,916 | 16,082,194 | 55,966,794 |
| Indian Territory..... | 19,575,040 | 30,586 | 10,800,640 | 8,774,400 |
| New Mexico..... | 77,568,640 | 121,201 | 49,980,824 | 27,484,975 |
| Oklahoma..... | 24,499,680 | 38,437 | 24,499,680 | ..... |
| Utah..... | 54,064,640 | 84,476 | 16,036,429 | 37,772,650 |
| Totals..... | 1,815,424,388 | 2,886,757 | 1,042,844,034 | 763,671,546 |

The total value of farm and ranch animals in the United States on Jan. 1, 1897, was estimated at \$1,655,414,632. The animals included 14,364,687 horses, 2,215,654 mules, 15,941,727 milch cows, 30,508,408 oxen and other cattle, 36,818,643 sheep, and 40,600,276 swine.

FORESTRY.—In connection with the great forests of the country, the preparation of lumber or timber is important. There were 25,708 establishments for this purpose in 1880, with a capital of \$180,000,000, employing 146,880 hands, using materials valued at \$146,000,000, the value of the produce being \$233,000,000. For 1888 the total product of lumber was estimated at 30,000,000,000 cubic feet, valued at \$600,000,000.

FISHERIES.—The value of the fisheries of the United States in the census year 1890 was as follows: General food and bait fisheries, \$21,242,956; menhaden fishery, \$638,668; oyster, clam, and scallop fisheries, \$18,100,598; crab, lobster, and shrimp fisheries, \$2,028,282; turtle and terrapin fisheries, \$215,316; whale fisheries, \$2,146,136; seal and sea-otter fisheries, \$502,180; and sponge fishery, \$438,682—total, \$45,312,818.

MANUFACTURES.—The great manufacturing states are New York, Pennsylvania, Ohio, Massachusetts, Illinois, Indiana, and Michigan. Since 1890, the southern states, formerly almost wholly agricultural, have developed great manufacturing industries that threaten to rival those of the north. This is especially true of Georgia and Alabama.

The following table gives the officially revised summary of the

MANUFACTURES OF THE UNITED STATES BY STATES AND TERRITORIES IN 1890.

| STATES AND TERRITORIES. | Establishments. | Aggregate Capital. | Persons Employed. | Wages Paid. | Cost of Materials. | Value of Products. |
|-------------------------|-----------------|--------------------|-------------------|-----------------|--------------------|--------------------|
| Alabama..... | 2,977 | \$46,122,571 | 33,821 | \$12,676,029 | \$28,432,281 | \$51,226,605 |
| Alaska..... | 10 | 105,727 | 86 | 22,173 | 30,198 | 58,440 |
| Arizona..... | 76 | 616,629 | 528 | 358,127 | 353,814 | 947,547 |
| Arkansas..... | 2,073 | 14,971,614 | 15,972 | 5,749,888 | 12,397,261 | 22,659,179 |
| California..... | 7,923 | 146,797,102 | 83,642 | 51,538,780 | 120,241,025 | 213,404,096 |
| Colorado..... | 1,518 | 26,651,840 | 17,067 | 12,285,734 | 20,848,516 | 42,480,205 |
| Connecticut..... | 6,822 | 227,004,496 | 149,939 | 75,990,606 | 123,183,080 | 248,336,364 |
| Delaware..... | 1,003 | 33,695,400 | 21,906 | 9,892,387 | 21,161,752 | 37,571,848 |
| Dist. of Columbia..... | 2,295 | 28,865,089 | 23,404 | 14,622,264 | 17,194,666 | 39,331,437 |
| Florida..... | 805 | 11,110,304 | 13,927 | 6,513,068 | 8,021,854 | 18,222,890 |
| Georgia..... | 4,285 | 56,921,580 | 56,383 | 17,312,196 | 35,774,480 | 68,917,020 |
| Idaho..... | 140 | 1,048,916 | 774 | 324,202 | 638,673 | 1,396,096 |
| Illinois..... | 20,482 | 502,804,512 | 312,198 | 171,523,579 | 529,019,089 | 908,640,288 |
| Indiana..... | 12,354 | 132,405,366 | 124,349 | 51,749,976 | 130,119,106 | 226,825,082 |
| Indian Territory..... | 20 | 204,329 | 175 | 79,830 | 127,864 | 248,932 |
| Iowa..... | 7,440 | 77,513,097 | 59,174 | 25,878,997 | 79,292,407 | 125,049,183 |
| Kansas..... | 4,471 | 43,926,002 | 32,843 | 16,328,485 | 78,845,167 | 110,219,805 |
| Kentucky..... | 7,745 | 79,811,980 | 65,579 | 27,761,746 | 61,588,583 | 126,719,857 |
| Louisiana..... | 2,613 | 34,754,121 | 31,901 | 13,159,564 | 33,282,724 | 57,806,713 |
| Maine..... | 5,010 | 80,419,809 | 75,780 | 26,526,217 | 51,520,589 | 95,689,590 |
| Maryland..... | 7,485 | 119,667,316 | 107,054 | 41,526,832 | 92,059,390 | 171,842,593 |
| Massachusetts..... | 26,923 | 630,032,341 | 485,182 | 239,670,509 | 473,199,434 | 888,160,403 |
| Michigan..... | 12,127 | 262,412,240 | 163,941 | 66,347,798 | 154,521,918 | 277,896,706 |
| Minnesota..... | 7,505 | 127,686,618 | 79,629 | 38,189,239 | 118,481,941 | 192,033,478 |
| Mississippi..... | 1,698 | 14,896,884 | 15,817 | 4,913,863 | 10,064,897 | 18,705,834 |
| Missouri..... | 14,045 | 189,236,422 | 142,924 | 76,327,907 | 177,107,885 | 323,897,688 |
| Montana..... | 289 | 4,293,794 | 2,696 | 1,948,213 | 2,375,093 | 5,507,573 |
| Nebraska..... | 3,014 | 37,569,508 | 23,876 | 12,984,571 | 67,334,532 | 93,037,794 |
| Nevada..... | 95 | 1,211,269 | 620 | 445,503 | 439,058 | 1,105,063 |
| New Hampshire..... | 3,229 | 79,375,160 | 63,361 | 24,243,054 | 47,754,152 | 85,770,549 |
| New Jersey..... | 9,221 | 249,890,428 | 186,901 | 96,509,703 | 188,960,704 | 353,179,917 |
| New Mexico..... | 127 | 965,938 | 944 | 532,727 | 691,420 | 1,516,195 |
| New York..... | 65,840 | 1,130,161,195 | 850,084 | 466,846,642 | 871,264,085 | 1,711,577,671 |
| North Carolina..... | 3,667 | 32,745,995 | 36,214 | 7,830,536 | 22,789,187 | 40,375,450 |
| North Dakota..... | 382 | 2,894,553 | 1,847 | 1,002,881 | 3,087,161 | 5,028,107 |
| Ohio..... | 28,673 | 402,793,019 | 331,548 | 158,768,883 | 341,016,644 | 641,688,064 |
| Oklahoma..... | 72 | 95,519 | 195 | 71,918 | 56,518 | 180,445 |
| Oregon..... | 1,523 | 32,122,051 | 18,798 | 11,535,229 | 21,793,578 | 41,432,174 |
| Pennsylvania..... | 39,336 | 990,999,375 | 620,484 | 305,556,229 | 773,530,105 | 1,331,623,101 |
| Rhode Island..... | 3,377 | 126,483,401 | 85,976 | 37,927,921 | 76,253,023 | 142,500,625 |
| South Carolina..... | 2,382 | 29,276,261 | 24,662 | 6,590,983 | 18,873,666 | 31,926,681 |
| South Dakota..... | 499 | 3,207,796 | 2,422 | 1,098,418 | 3,523,840 | 5,682,748 |
| Tennessee..... | 4,559 | 51,475,092 | 42,759 | 16,899,351 | 40,463,782 | 72,355,286 |
| Texas..... | 5,268 | 46,815,181 | 39,475 | 18,586,338 | 36,152,308 | 70,433,551 |
| Utah..... | 531 | 6,583,022 | 4,980 | 2,715,805 | 4,252,030 | 8,911,047 |
| Vermont..... | 3,031 | 32,763,291 | 24,894 | 10,096,549 | 20,433,174 | 38,540,066 |
| Virginia..... | 5,915 | 63,456,799 | 59,591 | 19,044,850 | 50,148,285 | 88,363,824 |
| Washington..... | 1,543 | 34,369,735 | 20,366 | 12,658,614 | 19,917,067 | 41,768,022 |
| West Virginia..... | 2,376 | 28,118,080 | 21,969 | 8,330,997 | 23,729,089 | 38,702,125 |
| Wisconsin..... | 10,417 | 246,515,404 | 132,031 | 51,843,708 | 145,437,016 | 248,546,164 |
| Wyoming..... | 190 | 1,411,184 | 1,144 | 878,646 | 1,084,432 | 2,367,601 |
| Totals..... | 355,401 | \$6,524,475,305 | 4,711,832 | \$2,282,823,265 | \$5,158,868,353 | \$9,370,107,624 |

The most important manufactures according to value of output were: Boots and shoes, factory product, \$220,649,358; carriages and wagons, \$114,570,555; cars for steam railroads, \$129,461,698; clothing, men's, factory product, \$251,019,609; cotton goods, \$267,981,724; flour and grist-mill products, \$513,971,474; foundry and machine shop products, \$412,701,872; iron and steel, \$430,954,348; leather, tanned and curried, \$138,282,004; liquors, distilled, \$104,197,869; liquors, malt, \$182,731,622; lumber products from logs or bolts, \$403,667,575; lumber, planing-mill products, \$183,681,552; sugar and molasses, \$123,118,259; tobacco, cigars and cigarettes, \$129,693,275; and woolen goods, \$133,577,977.

Pennsylvania continues to occupy the position of the leading producer of steel in the United States, producing 57 per cent. of the total production in 1880 and 62 per cent. in 1890. Illinois was second in rank in both years and Ohio was third. From 1880 to 1890 the increase in production in Pennsylvania was 324 per cent., in Illinois 241 per cent., and in Ohio 314 per cent. Since 1880 the manufacture of steel has been abandoned in two states, viz., Rhode Island and Vermont, and seven states have engaged in its production, viz., Alabama, California, Colorado, Indiana, Michigan, Virginia, and West Virginia. See COPPER, TIN.

SYNOPSIS OF HISTORY.—COLONIAL PERIOD.—The territories now occupied by the United States of America, though they were probably visited on their north-eastern coast by Norse navigators about the year 1000, continued the sole possession of numerous tribes of Indians (who had succeeded earlier and extinct races), until the discovery of America by Columbus, 1492. In 1498 an English expedition, under the command of Sebastian Cabot, explored the eastern coast of America from Labrador to Virginia, perhaps to Florida. In 1513 Juan Ponce de Leon landed near St. Augustine in Florida, and explored a portion of that region in a romantic search for the fountain of youth. In 1520 some Spanish vessels from St. Domingo were driven upon the coast of Carolina. In 1521, by the conquests of Cortes and his followers, Mexico, including Texas, New Mexico, and California became a province of Spain. In 1539–42, Ferdinand de Soto led a Spanish expedition from the coast of Florida across Alabama and discovered the Mississippi river. In 1584–85, Sir Walter Raleigh sent two expeditions to the coast of North Carolina and attempted to form settlements on Roanoke island. A Spanish settlement was made at St. Augustine, Florida, 1565. Jamestown, Virginia, was settled in 1607; New York, then called the New Netherlands, 1613; Plymouth, Massachusetts, 1620. A large part of the country on the great lakes and on the Mississippi was explored by La Salle in 1682; and settlements were made by the French at Kaskaskia and Arkansas Post, 1685; Mobile and Vincennes, 1702. The early history of the various colonies which now constitute the United States will be found under the heads of the different states and territories. The first effort at a union of colonies was in 1643, when the settlements in Massachusetts, New Hampshire, Rhode Island, and Connecticut formed a confederacy for mutual defense against the French, Dutch, and Indians, under the title of "The United Colonies of New England." They experienced the benefits of united action in 1754, when an English grant of lands to the Ohio company brought on the French and Indian war—the French claiming, at that period, as the first explorers, northern New England, half of New York, and the entire Mississippi valley. George Washington was sent on his first expedition, to remonstrate with the French authorities; and the colonies being advised to unite for general defense, a plan for a general government of all the English colonies was drawn up by Benjamin Franklin; but it was rejected by both the colonies and the crown—by the colonies, who wished to preserve their separate independence, and by the crown from a jealousy of their united strength. The colonists, however, took an active part in the war. Under Maj. Washington, they joined Gen. Braddock in his unfortunate expedition against Fort du Quesne, now Pittsburg; they aided in the reduction of Louisburg, Ticonderoga, Crown Point, and Niagara; and rejoiced in the conquest of Quebec, by which the vast northern regions of America became the possessions of Great Britain.

The principles of a democratic or representative government were brought to America by the earliest colonists. The colonies themselves were founded by private adventure, with very little aid from government. The Plymouth colony was for eighteen years a strict democracy, and afterwards a republic under a charter from the crown. A representative and popular government was established in Virginia in 1620. It was not until the protectorate and the reign of Charles II. that the colonies were considered as portions of the empire, to be governed by parliament, when navigation acts were passed to give English ships a monopoly of commerce, when the produce of the colonies was required to be sent to England, and duties were levied on commodities sent from one colony to another. Protests were made against these assumptions; Virginia asserted her right of self-government; and it was not until the English revolution of 1688 that settled and uniform relations with the different colonies were established.

In 1713, by the treaty of Utrecht, England, which, since the reign of Elizabeth, had imported slaves from Africa into her American and West Indian colonies, obtained a monopoly of the slave-trade, engaging to furnish Spanish America, in 33 years, with 144,000 negroes. A great slave-trading company was formed in England, one-quarter of the stock being taken by Queen Anne, and one-quarter by the king of Spain, these two sovereigns becoming the greatest slave-dealers in Christendom. By this monopoly, slavery was extended in, and to some extent forced upon, all the American colonies.

At this period, there was a general feeling of loyalty toward the mother country. The sons of the more wealthy colonists, especially in the south, were educated in England; English literature pervaded the colonies; the British throne was the fountain of honor; the colonies, though distinct, and differing in origin and character—Puritan in the east, Dutch Reformed in New York, Quaker in Pennsylvania, Catholic in Maryland, and Church of England in Virginia—were yet united by language, common ties, fears, and interests. In 1761 the enforcement of the navigation act against illegal traders, by general search-warrants, caused a strong excitement against the government, especially

in Boston. The admiralty enforced the law ; many vessels were seized ; and the colonial trade with the West Indies was annihilated. In 1765 the passing of an act of parliament for collecting a colonial revenue by stamps caused general indignation and led to riots. Patrick Henry, in the Virginia Assembly, denied the right of parliament to tax America, and eloquently asserted the dogma, "no taxation without representation." The first impulse was to unite against a common danger ; and the first colonial Congress of twenty-eight delegates, representing nine colonies, made a statement of grievances and a declaration of rights. The stamps were destroyed or reshipped to England, and popular societies were formed in the chief towns, called "Sons of Liberty." In 1766 the stamp act was repealed, to the general joy of the colonists ; but the principle of colonial taxation was not abandoned ; and in 1767 duties were levied on glass, papers, printers' colors, and tea. This renewed attempt produced, in 1768, riots in Boston, and Governor Gage was furnished with a military force of 700 to preserve order and enforce the laws. In 1773 the duties were repealed, excepting 3d. a pound on tea. It was now a question of principle, and from north to south it was determined that this tax should not be paid. Some cargoes were stored in damp warehouses and spoiled ; some sent back ; in Boston, a mob, disguised as Indians, threw it into the harbor. To punish this outrage, parliament passed the Boston Port Bill, 1774, by which the chief town of New England was no longer a port of entry, and its trade transferred to Salem. The people were reduced to great distress, but received the sympathy of all the colonies, and liberal contributions of wheat from Virginia, and rice from Charleston, South Carolina.

WAR OF INDEPENDENCE.—It was now determined to enforce the government of the crown and parliament over the colonies ; and a fleet, containing several ships of the line, and 10,000 troops, was sent to America ; while the colonists, still asserting their loyalty, and with little or no thought of separation from the mother country, prepared to resist what they considered the unconstitutional assumptions of the government. Volunteers were drilling in every direction, and depots of provisions and military stores were being gathered. A small force being sent from Boston to seize one of these depots at Concord, Mass., led to what is called the battle of Lexington, and the beginning of the war of the revolution, April 19, 1775. The British troops were attacked on their return by the provincials, and compelled to a hasty retreat. The news of this event summoned 20,000 men to the vicinity of Boston. The royal forts and arsenals of the colonies were taken possession of, with their arms and munitions. Crown Point and Ticonderoga, the principal northern fortifications, were surprised, and their artillery and stores appropriated. A Congress of the colonies assembled at Philadelphia, which resolved to raise and equip an army of 20,000 men, and appointed George Washington commander-in-chief. On June 17, Breed's Hill, in Charleston, near Boston, where 1500 Americans had hastily intrenched themselves, was taken by assault by the British troops, but with so heavy a loss (1054) that the defeat had for the provincials the moral effect of a victory. After a winter of great privations the British were compelled to evacuate Boston, carrying away in their fleet to Halifax 1500 loyal families.

The British government now put forth a strong effort to reduce the colonies to submission. An army of 55,000, including 17,000 German mercenaries ("Hessians"), was sent, under the command of Sir William Howe, to put down this "wicked rebellion." The provincial Congress, declaring that the royal authority had ceased, recommended to the several colonies to adopt "such governments as might best conduce to the safety and happiness of the people ;" and the thirteen colonies soon adopted constitutions as independent and sovereign states. On June 7, 1776, Richard Henry Lee, of Virginia, offered a resolution in Congress, declaring that "the united colonies are, and ought to be, free and independent states : that they are absolved from all allegiance to the British crown ; and that all political connection between them and the state of Great Britain is, and ought to be, totally dissolved." This resolution, after an earnest debate, was adopted by the votes of nine out of thirteen colonies. A committee, consisting of Thomas Jefferson, John Adams, Benjamin Franklin, Roger Sherman, and Robert R. Livingston, was instructed to prepare a declaration in accordance with the above resolution ; and the celebrated Declaration of Independence, written by Mr. Jefferson, based upon the equality of men and the universal right of self-government, and asserting that "all government derives its just powers from the consent of the governed," on July 4, 1776, received the assent of the delegates of the colonies, which thus dissolved their allegiance to the British crown, and declared themselves free and independent states, under the general title of the thirteen United States of America—New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, New Jersey, Pennsylvania, Delaware, Maryland, Virginia, North Carolina, South Carolina, and Georgia—occupying a narrow line of the Atlantic coast between Canada and Florida, e. of the Alleghanies, with a population of about 2,500,000 souls.

After the evacuation of Boston, Gen. Washington, with the remains of his army, thinned by the hardships of winter, hastened to New York. On July 2, Gen. Howe, being joined by his brother, Admiral Lord Howe, and Sir Henry Clinton, found himself at the head of 35,000 men ; defeated the Americans on Long Island, Aug. 27, 1776, compelled the evacuation of New York, and secured the possession of its spacious harbor and the river Hudson. Gen. Washington, with inferior and undisciplined forces, retreated across New Jersey, closely followed by the English, hoping to save Phila-

delphia. Newark, New Brunswick, Princeton, the chief towns in New Jersey, were taken, and the British awaited the freezing of the Delaware to occupy Philadelphia. On Christmas night, Gen. Washington, by crossing in boats among floating ice, made a successful night attack upon a Hessian force at Trenton, and gave new courage to the desponding Americans, who recruited the army, and harassed the enemy with a winter campaign.

In the mean time Silas Deane and Benjamin Franklin had been sent to France to solicit recognition and aid. The recognition was delayed, but important aid was privately given in money and supplies, and European volunteers—the Marquis de Lafayette, Baron Steuben, Baron de Kalb, Kosciusko, and Pulaski—rendered the most important services. Efforts were made to induce the British colonies of Canada and Nova Scotia to unite in the struggle for independence, and an expedition was sent against Montreal and Quebec, led by Gens. Montgomery and Arnold. The Canadians refused their aid; Montgomery was killed, Arnold wounded, and the remains of the expedition returned after terrible sufferings. In 1777, after several severe actions in New Jersey, generally disastrous to the Americans, the British took possession of Philadelphia; and Washington, with the remnants of his army, went into winter-quarters at Valley Forge, where they suffered from cold, hunger, and nakedness.

While Washington was unsuccessfully contending against disciplined and overwhelming forces in New Jersey, Gen. Burgoyne was leading an army of 7000 British and German troops, with a large force of Canadians and Indians, from Canada into northern New York, to form a junction with the British on the Hudson, and separate New England from the rest of the Confederacy. His march was delayed by felled trees and destroyed roads; his foraging expeditions were defeated; and, after two sharp actions at Stillwater and Saratoga, with but three days' rations left, he was compelled to capitulate, Oct. 17; and England, in the midst of victories, heard with dismay of the loss of an entire army. The Americans gained 5000 muskets and a large train of artillery. Feeling the need of more unity of action, articles of confederation, proposed by Franklin in 1775, were adopted in 1777, which constituted a league of friendship between the states, but not a government which had any powers of coercion.

In 1778, Lord Carlisle was sent to America by the British government with offers of conciliation; it was too late. France, at the same time, recognized American independence, and sent a large fleet and supplies of clothing, arms, and munitions of war to their aid; and Gen. Clinton, who had superseded Gen. Howe, finding his supplies at Philadelphia threatened, retreated to New York, defeating the Americans at Monmouth.

The repeated victories of the British armies, the aid afforded by great numbers of Americans who still adhered to the royal cause, and furnished during the war not less than 20,000 troops, and the alliance of large tribes of Indians, who committed cruel ravages in the frontier settlements, did little toward subjugating the country. Portions of the sea-coast of New England and Virginia were laid waste; but the king's troops were worn out with long marches and tedious campaigns, and even weakened by victories. Spain, and then Holland, joined in the war against England, and aided the Americans. Paul Jones, with ships fitted out in French harbors, fought desperate battles under the American flag on the English coast. But the king and parliament were determined to maintain the honor of the crown and the integrity of the empire. In 1780, 85,000 seamen were raised, and 35,000 additional troops sent to America, and a strong effort was made to subjugate the Carolinas, where the war assumed a bitter partisan character, and was conducted with spirit by Sumpter, Marion, and other southern chieftains. Lord Cornwallis, with a large army, marched from Charleston, through North Carolina, pursuing, and sometimes defeating, the American Gen. Gates. Worn out with his success, he arrived in Virginia, where he was confronted by Gen. Lafayette. In the mean time, Admiral de Varney had arrived upon the coast with a powerful French fleet, and 6000 soldiers of the *élite* of the French army, under the Count de Rochambeau. Cornwallis was obliged to fortify himself at Yorktown, blockaded by the fleet of Count de Grasse, and besieged by the allied army of French and Americans, waiting for Sir Henry Clinton to send him relief from New York. Oct. 19, 1781, he was compelled to surrender his army of 7000 men—an event which produced such a change of feeling in England as to cause the resignation of the ministry, and the dispatch of Gen. Sir Guy Carleton to New York with offers of terms of peace. The preliminaries were signed at Paris, Nov. 30, 1782; and on Sept. 3, 1783, peace was concluded between England and France, Holland, and America. The independence of each of the several states was acknowledged, with a liberal settlement of territorial boundaries. In April, a cessation of hostilities had been proclaimed, and the American army disbanded; New York, which had been held by the English through the whole war, was evacuated Nov. 25; on Dec. 4, Gen. Washington took leave of his companions in arms, and Dec. 23, resigned into the hands of Congress his commission as commander.

From the retreat of Lexington, April 19, 1775, to the surrender of Yorktown, Oct. 19, 1781, in 24 engagements, including the surrender of two armies, the British losses in the field were not less than 25,000 men, while those of the Americans were about 8000. The expenditure of money in carrying on the war had been \$130,000,000, exclusive of personal losses and those of the individual states.

THE CONFEDERATION.—The long war had now ended; the colonies were free; but the

condition of the young confederacy seemed most discouraging. Its treasury was empty, it was burdened with a foreign debt of \$8,000,000, and domestic obligations (chiefly to the officers and soldiers of the continental army) of \$30,000,000, and a paper currency of nearly \$90,000,000 which no one would receive. Moreover, the Congress which had incurred these various obligations had no power to provide for discharging them. It could only make *recommendations* to the states and urge them to provide their share toward the expenses of the government; but the states were themselves in debt, and unwilling to respond to the demands of the Congress. The very treaty that the Congress had concluded with Great Britain, contained stipulations which it could not carry out, and in consequence the British garrisons on the frontier were not withdrawn, and the representatives of England treated the American government with open contempt. The lawlessness generated in all communities by a state of war, found vent in open resistance to constituted authority, and in Massachusetts, in 1786, a portion of the people actually organized to resist the collection of debts, and to close the local courts. This outbreak was known as Shays's Rebellion from its leader, one Daniel Shays, a captain in the Continental army, who at the head of a thousand men marched to Worcester, broke up the sitting of the Supreme Court and repeated the same daring act at Springfield. Through the firmness and courage of the governor, James Bowdoin, the insurrection was suppressed, but the most alarming fact was that Congress, although it raised troops in case such an emergency should again arise, did not venture openly to declare the object for which these troops were enlisted. In short, it dared not assert either the will or the power to deal with a rebellion.

The whole history of the war had, in fact, served to show the shortcomings of the Confederation. These came mainly from one great defect; its inability to force the citizens to comply with its wishes. After the war this was even more felt. Congress had no power of maintaining an army or navy, no control over trade, no means of raising public funds, and no mode of enforcing its will but by an appeal to arms. In the words of Washington, it was "little more than a shadow without the substance." Moreover, from its want of power, it was despised and neglected by those who should have been its chief supporters. The ablest men were occupied with the politics of their own states. Congress consisted of little more than twenty members. The evils of this were soon made evident. In 1786, after some difficulty, twelve states had assented to a general system of import duties. The thirteenth, however, New York, resisted, and thus one state was able to hinder a measure which was needful for the credit and security of the whole nation. So, too, articles in the treaty with England were set at naught by the different state governments. The treaty provided that all debts incurred up to that time between citizens of either country should still hold good; that no person should suffer any loss or damage for any part which he might have taken in the war. Laws, however, were passed by the various State Legislatures in direct defiance of these articles, and all that Congress could do was to exhort them to annul these laws and to comply with the treaty.

In this state of things, thoughtful men began to see that, if the United States were to exist as a nation, there must be a central government with direct power both in internal and external affairs; able to carry on foreign negotiations in the name of the nation; to issue commands to the citizens of the states, to enforce these commands, if necessary, and to punish those who neglected them. The first man clearly to perceive and boldly to declare this was Alexander Hamilton.

Though he had been among the most ardent supporters of American independence, he was no advocate of the system of government that had been the immediate result of the war. He wished his countrymen to secure the advantages of a strong central government, and the model that he had in mind was the English system, of course without the monarchical principle. In 1785 an opportunity occurred of effecting, or at least of suggesting, a radical change. In that year commissioners were appointed by Virginia and Maryland to settle certain difficulties about the navigation of the Potomac river and Chesapeake Bay. They met at Mount Vernon, Washington's home, and there a plan was proposed for maintaining a fleet on the Chesapeake, and for settling commercial duties. This led to the proposal made by the Assembly of Virginia for a general conference of commissioners from all the states to consider the state of trade. Hamilton saw that this conference might be made the instrument of wider changes, and he persuaded New York to send commissioners, himself among them. In 1786 commissioners from five states met at Annapolis in Maryland. Hamilton laid before them a report, giving reasons why it would be well if a convention of delegates from all the states should meet to consider the state of the national government. The proposal was adopted and a convention met at Philadelphia in 1787 under the presidency of George Washington.

Two rough plans were laid before the Convention, one by Edmund Randolph of Virginia, the other by William Patterson of New Jersey. The former which, with some changes, was finally accepted, represented the views of those who wanted a strong central Government, the Federal party, as they were afterwards called; the other, those of their opponents. Hamilton also brought forward a scheme, but this went so far beyond the wishes and views of the mass of the Federalists, that it met with no support. Finally Randolph's plan was adopted, and the Convention applied itself to casting it

into shape. The result, with some changes, has continued to be the Constitution of the United States to the present day. (See CONSTITUTION.)

When the constitution had been drawn up, the difficulties of its framers had little more than begun. The question at once arose, how was the Constitution to be put in force? Congress had no power to grant away its own authority to a new government, nor had the nation enough confidence in it to accept its decision. Accordingly the Convention resolved to lay it before the various states. The serious question then arose, What was to be done if some states accepted, some refused? Finally, it was decided that, if nine states accepted it, the constitution should take effect, and that, if any of the remaining states refused, they must be left out of the new confederation. Accordingly conventions of the various states were summoned. The contest was a hard one. Great service was done to the cause of the constitution by a series of essays called the *Federalist*. These were written by Hamilton, Madison, and a third Federal statesman, Jay. The struggle was most severe in New York and Virginia, but in both the constitution at length prevailed. In New York the result was mainly due to Hamilton. In Virginia Patrick Henry opposed it with the utmost animosity, and with the power and eloquence of his best days.

But on June 21st, 1788, the ninth state had ratified the constitution. New York and Virginia soon after accepted it, leaving only North Carolina and Rhode Island without the new Union. On July 14th, 1788, the Congress of the Confederation referred the ratification to a committee which arranged a plan for carrying the new government into operation. The first Wednesday of January, 1789, was selected for the choice of electors for President and Vice-President, and the first Wednesday in February for the voting of the electors. Soon after the adoption of the Constitution, eleven amendments, popularly known as the Bill of Rights were added to it in order the more explicitly to guard the rights of the individual citizen.

At this time and until 1805, each presidential elector voted by ballot for two persons. In case a majority of all the votes were cast for any person, he became President; and the person receiving the next greatest number became Vice-President. On the counting of the votes in 1789, George Washington was found to have received 69 votes, or one from each elector; and John Adams to have received 34.

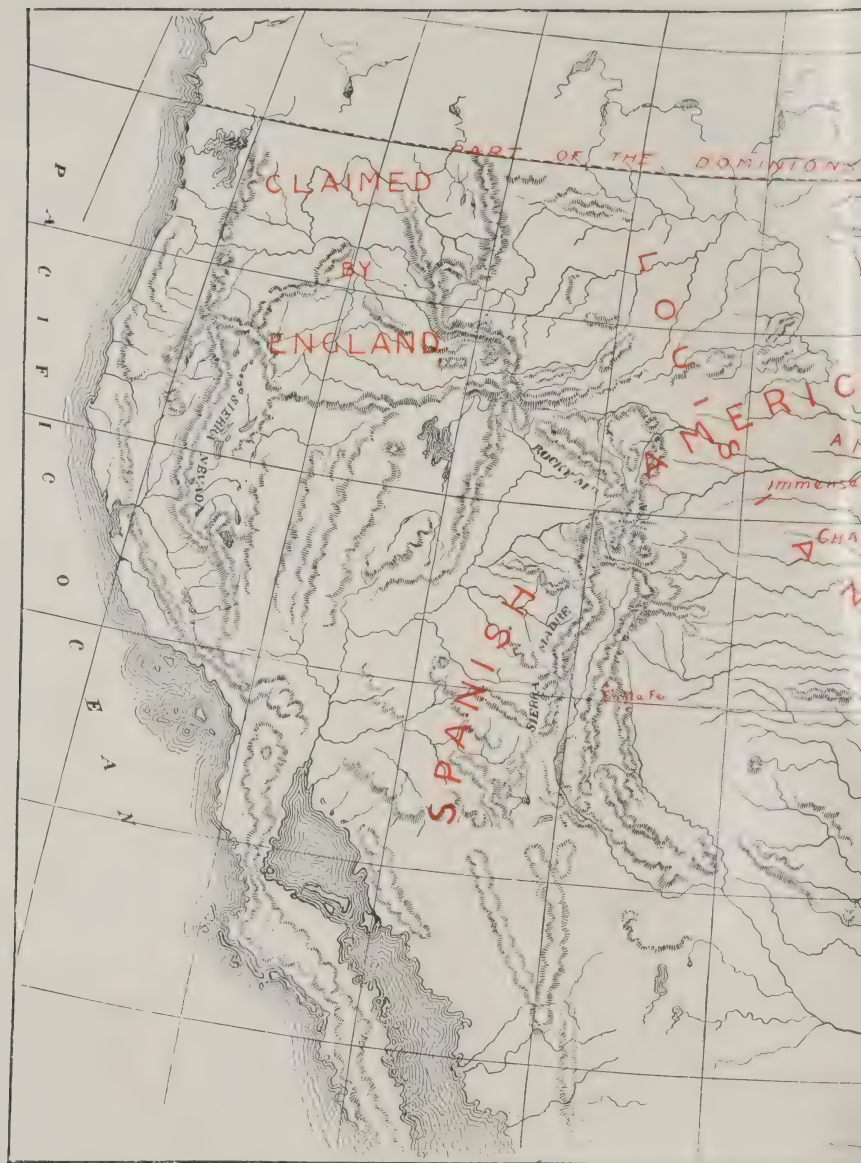
I. and II. ADMINISTRATION OF GEORGE WASHINGTON (1789-1797). *Cabinets*.—*Secretary of State*, Thomas Jefferson, Virginia, September 26th, 1789; Edmund Randolph, Virginia, January 2d, 1794; Timothy Pickering, Pennsylvania, December 10th, 1795. *Secretary of Treasury*, Alexander Hamilton, New York, September 11th, 1789; Oliver Wolcott, Connecticut, February 2d, 1795. *Secretary of War*, Henry Knox, Massachusetts, September 12th, 1789; Timothy Pickering, Pennsylvania, January 2d, 1795; James McHenry, Maryland, January 27th, 1796. *Attorney-General*, Edmund Randolph, Virginia, September 26th, 1789; William Bradford, Pennsylvania, January 27th, 1794; Charles Lee, Virginia, December 10th, 1795. *Postmaster-General*,* Samuel Osgood, Massachusetts, September 26th, 1789; Timothy Pickering, Pennsylvania, August 12th, 1791; Joseph Habersham, Georgia, February 25th, 1795.

George Washington was sworn into office at the City Hall, New York, on April 30th, 1789. The Congress which was then in session elected Frederick A. Muhlenberg, of Pennsylvania, as the first Speaker of the House. The early days of the session witnessed a gradual formation of political parties on the lines of greater or less centralization, those favoring a liberal interpretation of the powers of the Federal government being known as Federalists, and those favoring a very strict interpretation and limitation of these powers, receiving at first the name of Anti-Federalists, but subsequently that of Democratic-Republicans. Washington endeavored to hold the balance even between the two conflicting factions, and in making up his cabinet, called to it both Hamilton, the greatest leader of the Federalists, and Jefferson, the ablest advocate of Anti-Federalist doctrine.

The chief events of Washington's first administration, were the adoption of a tariff (see TARIFF), the settlement of the public debt in accordance with the recommendations of Hamilton, who advised that the United States should assume in full all the debts incurred during the revolution, not only by the Confederation but by the States; the adoption of a site for the new capital of the nation; the ratification of the Constitution by North Carolina (Nov., 1789), and Rhode Island (May, 1790), the establishment of a National Bank (1791), and the admission of Vermont (March, 1791), and Kentucky (June, 1792), to the Union.

At the request of both Federalists and Republicans, Washington agreed to serve a second term as President, and was unanimously re-elected, as was John Adams to the office of Vice-President, though the latter was opposed by George Clinton, of New York, the Republican candidate. Washington's second term was one of much public turmoil and uneasiness, owing to the attitude of the two parties toward France and England, then at war. The Federalists expressed an open sympathy with England; the Republicans with France. The action of the French minister to the United States, known as "Citizen" Genet, did much to increase the popular excitement. He openly violated the President's proclamation of neutrality, endeavored to fit out French cruisers

* Not a member of the Cabinet until 1829, but attached to the Treasury.





ates in 1789.

in American ports, raised money and men for the service of France, and acted with such offensive and undisguised insolence toward Washington and his Cabinet, that the government demanded his recall. The turbulence resulting from his reckless course, however, had inflamed party passions to such an extent that even Washington's calm and dignified policy did not escape the bitterest partisan denunciation. This increased in volume and intensity when the so-called Jay Treaty with England, negotiated by Chief-Justice John Jay at the President's request, was laid before the Senate. England's course had been arrogant and far from conciliatory. She had impressed American seamen, had refused to evacuate the posts on the American frontiers, and had largely excluded American commerce from the West India trade. The Jay Treaty was far from securing the assurances from England that all believed to be justly due; but it embodied the best that could then be obtained, and the President signed it. It is almost impossible to believe how virulent became the aspersions now recklessly heaped upon the honored name of Washington. He was threatened with impeachment and even with assassination; he was accused of embezzlement, of treason, of usurpation, and the Republicans of the day styled him in ridicule, the "Step-father of his Country." Yet his action was soon justified by the general revival of commerce that followed the ratification of the Jay Treaty.

The other great events of Washington's second administration were the suppression of the so-called Whisky Insurrection (q.v.) in Pennsylvania (1794), the adoption of a plan for internal taxation (1795), the admission of Tennessee (June, 1796), and Washington's farewell address, which was given to the American people, Sept. 17, 1796. Its issuance was followed by the first contested Presidential election. As Washington declined again to be a candidate, the two great parties waged an open warfare for the election of his successor. The Federalist candidate, John Adams, received 71 votes, and the Anti-Federalist, Thomas Jefferson, 68 votes. Therefore, in accordance with the then prevailing system, John Adams became President—and Thomas Jefferson, Vice-President.

III. ADMINISTRATION OF JOHN ADAMS (1797–1801). *Cabinet.*—*Secretary of State*, Timothy Pickering, continued; John Marshall, Virginia, May 13th, 1800. *Secretary of Treasury*, Oliver Wolcott, continued; Samuel Dexter, Massachusetts, January 1st, 1801. *Secretary of War*, James McHenry, continued; Samuel Dexter, Massachusetts, May 13th, 1800; Roger Griswold, Connecticut, February 3d, 1801. *Secretary of Navy*,* George Cabot, Massachusetts, May 3d, 1798; Benjamin Stoddert, Maryland, May 21st, 1798. *Attorney-General*, Charles Lee, continued; Theophilus Parsons, Massachusetts, February 20th, 1801. *Postmaster-General*, Joseph Habersham, continued.

At first the prospects of the new administration and of the Federalist party seemed extremely favorable. The insolent action of the French Directory then at the head of affairs in France, in demanding of the American commissioners a bribe in return for a favorable hearing, inspired everywhere in the United States the most intense indignation. A war seemed imminent. General Washington was again summoned to command the army; an American frigate attacked and defeated a French one. But a change in the French government led to a reconciliation, and in 1800 a treaty removed the immediate cause of complaint. In the preceding year, the death of Washington caused universal lamentation.

Such popularity as the government had secured by its firm attitude toward France, was soon lost by the passage of the unwise "Alien and Sedition Laws" (1798). These empowered the President to order out of the United States, at his own discretion, any alien whose presence he should judge dangerous, and enforced penalties on any person who published false, scandalous, or malicious writings against the government, either House of Congress, or the President. Both these laws were generally felt to be opposed to the principles of the Constitution, and they brought the government into great disrepute. Congress, however, was still controlled by the Federalists, and hence the Republicans protested against the new enactments, through the medium of the state legislatures. Certain resolutions drawn by Jefferson were adopted in 1798 by the Kentucky legislature, and a second series written by Madison were passed by the legislature of Virginia. These, being essentially the same in principle, are known as the "Virginia and Kentucky Resolutions," or the "Resolutions of 1798." They are the first official statement of the party of State Rights and Strict Construction. The essential principle involved in them was that the Constitution is a compact between the states and the government; that each of the parties may be the judge of the infringement of the compact by the other; that the Alien and Sedition Laws being unconstitutional were such an infringement, and hence void. The Kentucky Resolutions specifically asserted the right of a state to "nullify" a Federal law—a doctrine that later led to momentous consequences. The immediate agitation against the obnoxious laws caused the defeat of the Federalist party in the presidential election of 1800. When the electoral votes were counted, there were found to be 73 for Thomas Jefferson, Republican, and the same number for Aaron Burr, while John Adams had 65. There being thus no choice, the election was thrown into the House of Representatives, which under the existing law was bound to choose between the first two candidates, each state having only a single

* Until this time the navy had been under the general direction of the War Department.

vote. After balloting for six days, Jefferson was elected, receiving the vote of ten states, while four states voted for Burr, and two voted in blank. Thomas Jefferson was thus made President, and Aaron Burr, Vice-President.

IV. and V. ADMINISTRATION OF THOMAS JEFFERSON (1801-1809). *Cabinet*.—*Secretary of State*, James Madison, Virginia, March 5th, 1801. *Secretary of Treasury*, Samuel Dexter, continued; Albert Gallatin, Pennsylvania, May 14th, 1801. *Secretary of War*, Henry Dearborn, Massachusetts, March 5th, 1801. *Secretary of Navy*, Benjamin Stoddert, continued; Robert Smith, Maryland, July 15th, 1801; Jacob Crowninshield, Massachusetts, May 3d, 1805. *Attorney-General*, Levi Lincoln, Massachusetts, March 5th, 1801; Robert Smith, Maryland, March 3d, 1805; John Breckinridge, Kentucky, August 7th, 1805; Cæsar A. Rodney, Pennsylvania, January 20th, 1807. *Postmaster-General*, Joseph Habersham, continued; Gideon Granger, Connecticut, November 28th, 1801.

The election of Jefferson marked the complete triumph of the Republicans. Jefferson made thirty-nine removals from office without cause, but chiefly of those whom Adams had appointed in the last hours of his administration and hence known as "midnight appointments." President Jefferson, whom his opponents described as "an atheist in religion and a fanatic in politics," began his term of power with the most extreme theories of the Loose Constructionists as his guide, but the force of circumstances led him to adopt and carry through measures that involved as liberal an interpretation of the Constitution as any that the Federalists had ever advanced. The first of these was the purchase from France in 1803 of the so-called Louisiana Territory recently acquired by France of Spain. This territory extended from the mouth of the Mississippi to its headwaters, and westward indefinitely to the Pacific. The price paid was \$15,000,000.

In 1801 the United States became engaged in their first foreign war. When the Federals came into power under Adams, the American navy was far too weak to protect the rapidly growing commerce of the country. In spite of the opposition of the Republicans, who were hostile to everything which strengthened the hands of the government, much had been done during Adams's presidency to put the navy on a better footing. The result of this was soon seen in the dealings of the American Government with the petty states on the coast of Barbary—namely, Tripoli, Algiers, Tunis, and Morocco. Pirates from these states, sanctioned by their rulers, harassed the commerce of civilized nations. The rapidly-growing trade of the United States was especially exposed to these attacks, and accordingly the American government, like some of the European governments, secured its citizens against the pirates by a yearly payment to the rulers of the Barbary States. In 1800, the Dey of Algiers, presuming on the weakness of the Americans, ordered the captain of the ship which brought the yearly tribute to take an ambassador for him to Constantinople. As the ship lay under the guns of the fort, the captain dared not endanger her by refusing. In 1801 the Pasha of Tripoli, thinking that his state had been treated with less respect than Algiers, threatened to declare war on America. In the following year the United States sent a fleet of four ships to pacify the Barbary States, or if war had been already declared, to attack them. The American commander found on his arrival that the Pasha of Tripoli had declared war. During the year the Americans took several ships belonging to Tripoli, but struck no serious blow. Next year a fleet of six ships was sent out to the Mediterranean under the command of Commodore Morris, to blockade Tripoli. In 1805 the naval operations were assisted by a land force under the command of Hamet Caramalli, the elder brother of the reigning Pasha, who had been deposed, and had fled to Egypt. With a mixed force, officered in part by Americans, he marched on Derne, a town in Tripoli, and took it. This is the only time that the American flag has ever been hoisted over any place in the Old World. Thus threatened both by land and sea, the Pasha was glad to make peace. No more tribute was to be paid, but the Pasha was to receive \$60,000 as ransom for American prisoners. Immediately afterwards, the Dey of Tunis threatened the American fleet with war, unless they restored a vessel which they had seized on its way into Tripoli. The American commander not only refused to do this, but told the Dey that no tribute would be paid in future. The Dey at first stormed, but, when the American fleet appeared before Tunis, he gave way entirely. These successes put an end, so far as the United States were concerned, to the practice of paying black-mail to the Mediterranean pirates.

In 1802 (Nov. 29th) Ohio was admitted to the Union; in 1803 the twelfth amendment to the Constitution was passed; and in 1804 Mr. Jefferson was re-elected President by the vote of all the states except Connecticut, Delaware, and a part of the votes of Maryland, which were cast for the Federalists, Charles C. Pinckney, of South Carolina and Rufus King, of New York. In July, 1804, Vice-President Burr shot Alexander Hamilton in a duel.

Jefferson's second administration began with overwhelming Republican majorities in both houses of Congress. The Napoleonic wars were still in progress, and it was impossible for so gigantic a struggle not to affect the interests of the United States. The commerce of America was highly prosperous, her ships enjoying much of the carrying trade of Europe; but in May, 1806, England declared a blockade from Brest to the Elbe, and Bonaparte, in November, decreed the blockade of the coasts of the United Kingdom. American vessels were captured by both parties, and were searched by

British ships for British subjects ; and those suspected of having been born on British soil, were, in accordance with the doctrine, "once a subject always a subject," impressed into the naval service. Even American men-of-war were not exempted from this process. The British frigate *Leopard* meeting the American frigate *Chesapeake*, demanded four of her men, and on refusal fired into her, and the surprised *Chesapeake* struck her flag. British ships were hereupon forbidden to enter American harbors.

In 1807 this measure was extended in the famous Embargo Bill, which forbade American vessels to leave foreign ports, and foreign vessels to take cargoes for American ports. This measure, which was intended to punish England and France for their contempt of American rights upon the sea, practically destroyed the commerce of the United States, and was violently opposed by the Federalists, especially in New England and New York, where the shipping interest was strongest. Jefferson's administration also witnessed the creation of a flotilla of gun-boats, the construction of a National Road from Maryland to Ohio (1806), and the abortive trial of Aaron Burr for treason (1807).

Following the example of Washington, Mr. Jefferson declined to be a candidate for a third term, and in the elections of 1808, James Madison, of Virginia, was elected President, and George Clinton, of New York, Vice-President, over the same Federalist candidates who had been defeated in 1804. In February, 1809, owing to the threatening attitude of the New England states, which menaced the government with secession, the Embargo was relaxed and the Non-Intercourse Act was substituted for it, repealing the provisions of the Embargo, except as against England and France.

VI. and VII. ADMINISTRATION OF JAMES MADISON (1809-1817). *Cabinet.*—*Secretary of State*, Robert Smith, Maryland, March 6th, 1809 ; James Monroe, Virginia, April 2d, 1811. *Secretary of Treasury*, Albert Gallatin, continued ; George W. Campbell, Tennessee, February 9th, 1814 ; A. J. Dallas, Pennsylvania, Oct. 6th, 1814 ; William H. Crawford, Georgia, October 22d, 1816. *Secretary of War*, William Eustis, Massachusetts, March 7th, 1809 ; John Armstrong, New York, January 13th, 1813 ; James Monroe, Virginia, September 27th, 1814 ; William H. Crawford, Georgia, August 1st, 1815. *Secretary of Navy*, Paul Hamilton, South Carolina, March 7th, 1809 ; William Jones, Pennsylvania, January 12th, 1813 ; B. W. Crowninshield, Massachusetts, December 19th, 1814. *Attorney-General*, C. A. Rodney, continued ; William Pinckney, Maryland, December 11th, 1811 ; Richard Rush, Pennsylvania, February 10th, 1814. *Postmaster-General*, Gideon Granger, continued ; Return J. Meigs, Ohio, March 17th, 1814.

The administration of Mr. Madison witnessed a further straining of the relations existing between the United States and England. Though the acts of France had been, in the main, no less unjust and arrogant than those of England, she had never attempted the impressment of American seamen, which had been made easy for England by identity of language, and by the fact that, in some cases, British deserters were actually found upon American ships. Moreover, the Republican party, now in power, had been traditionally the friend of France. Hence, as time went on, England was the nation especially singled out for American dislike, and this feeling increased when the West complained that British agents were exciting disaffection on the frontiers and intriguing with the Indians.

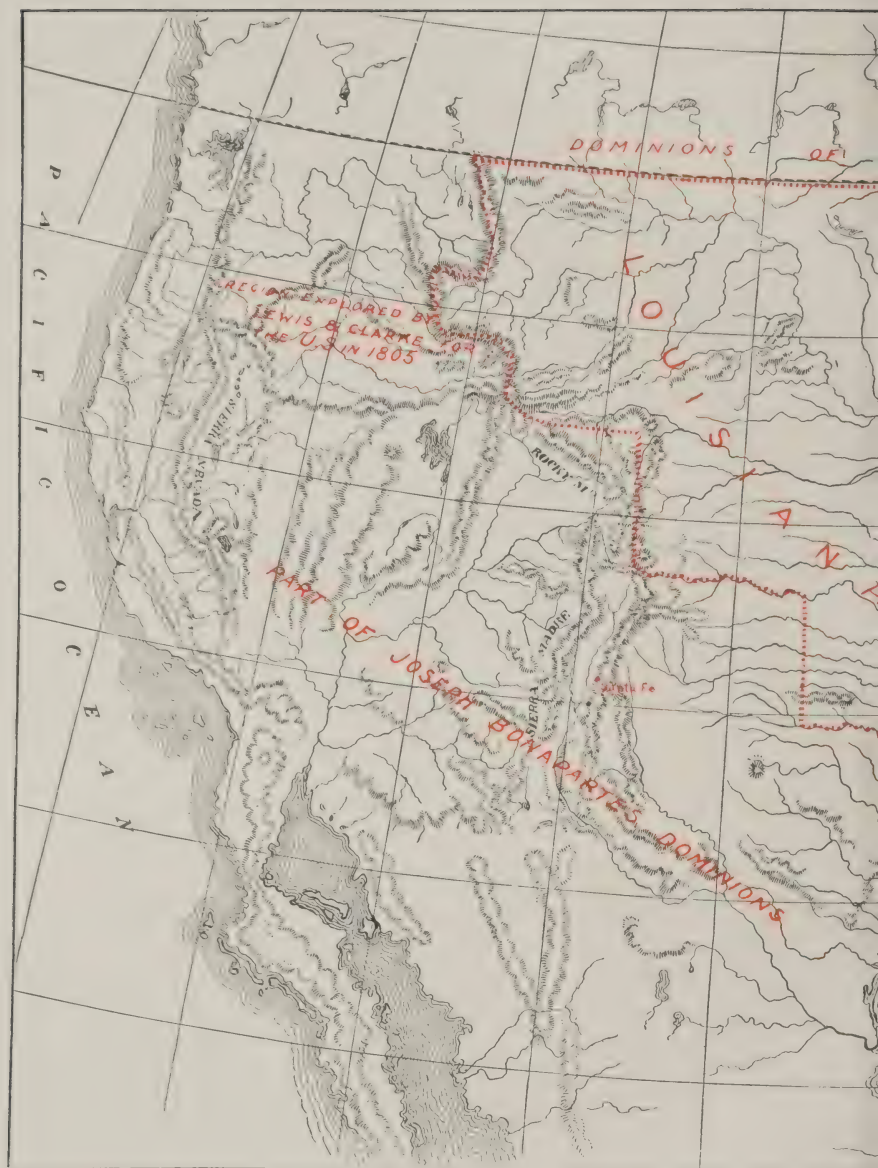
In 1810, England and France each professed a readiness to repeal the decrees that had so hampered American commerce, if the other would do so first. In 1811, Napoleon actually did withdraw the proclamations of which the United States complained. Meanwhile, an aggressive element had risen to prominence in the councils of the Republican party. Henry Clay, of Kentucky, was Speaker of the House ; and John C. Calhoun, of South Carolina, on the floor of the House was the master of the majority. Under the impulse of these two brilliant and impetuous spirits, the party in power became transformed into a war-party. Acts were passed to enlist soldiers, to organize the militia, to enlarge the navy, and to prepare in every way for war. The adoption of a war-policy was urged upon the President, who was himself reluctant to adopt it ; and his selection as the candidate of his party for a second term was plainly shown to be dependent upon his acceptance of the war. He yielded, and in Feb., 1812, was renominated, with Elbridge Gerry, of Massachusetts, for Vice-President. In the following month, England having refused to modify its policy toward neutrals, an embargo upon all American shipping was proclaimed for ninety days as a preliminary to war. Hence, on June 1st, Mr. Madison sent a message to Congress in which, after reviewing the American grievances against England, he recommended a formal declaration of war. On the 18th, Congress adopted the suggestion, and war was declared. Five days later, and before the declaration reached England, the British government withdrew its orders against commercial intercourse with France. Attempts were then made to restore peace, but each government stood firm on the point of the right of search, and reconciliation was impossible. Congress had voted to raise 25,000 enlisted soldiers, 50,000 volunteers, and 100,000 militia. Gen. Hull, with 2000 men at Detroit, invaded Canada ; but, on being met by a small force of British and Indians under Gen. Brock, recrossed the river, made a shameful surrender, and was sentenced to death for his cowardice, but pardoned by the President. A second invasion of Canada was made near Niagara Falls by Gen. Van Rensselaer. One thousand American militia stormed the heights of Queenstown, and the British general, Brock, was killed ; but re-enforcements arriving,

the heights were retaken, and nearly all the Americans were killed or driven into the Niagara, while the American general was in vain imploring a large body of militia on the opposite bank to cross over to the support of their brethren in arms. They refused, upon the ground that the government had no right to send the militia across the frontier. The Federal party, opposed to the war, defended this doctrine, and Gen. Van Rensselaer resigned in disgust. American disasters on the land were, however, compensated by victories at sea. On Aug. 19th, the United States frigate *Constitution* captured the British frigate *Guerrière*; on Oct. 18th the *Wasp* took the *Frolic*; on Oct. 25th the frigate *United States* captured the *Macedonian*; and on Dec. 29th the *Constitution* took the *Java*. The Americans, in most cases, had the larger ships and heavier ordnance; but the immense disparity in the losses showed also superior seamanship and gunnery. American privateers took 300 British vessels and 3000 prisoners. In 1813, Gen. Proctor crossed the Detroit River with a considerable force of British and Indians, and defeated Gen. Winchester, with the usual results of savage warfare. In April, an American army of 1700 men captured York, now Toronto, and about the same time another American force of 800 men was defeated with great loss by the Indians under Tecumseh; but the remainder of this campaign was wholly favorable to the Americans. The attempt of the British general, Prevost, on Sackett's Harbor, was repulsed; the British squadron on Lake Erie, consisting of 6 vessels, and 63 guns, was captured by Commodore Perry at the head of an American flotilla of 9 vessels and 54 guns; and this latter success enabled Gen. Harrison to invade Canada, where he defeated Gen. Proctor in the battle of the Thames, in which the great Indian warrior-chief Tecumseh was killed. In 1813 another invasion of Canada was attempted, York was taken by Gen. Dearborn, and an unsuccessful attempt was made to take Montreal. Villages were burned on both sides. The British also destroyed American shipping in Delaware Bay. At the same period Gen. Jackson defeated the Creek Indians in Alabama and Georgia, who had been excited to make war upon the frontier settlements.

In 1814, Gens. Scott and Ripley crossed the Niagara, and sharp actions, with no decisive results, were fought at Chippewa and Lundy's Lane, close by the great cataract. Gen. Wilkinson also invaded Canada on the Sorel River, but was easily repulsed. A British invasion, by Lake Champlain, by Gen. Sir George Prevost, with 14,000 men and a flotilla on the lake, was no more successful. On Sept. 6 the flotilla was defeated and captured in the harbor of Plattsburg, while the army was repulsed on shore, and retreated with heavy loss. In August, a British fleet ascended Chesapeake Bay, took Washington with but slight resistance, and burned the government buildings. A subsequent attack on Baltimore was unsuccessful. New York, New London, and Boston were blockaded, and a large expedition was sent against Mobile and New Orleans.

On Jan. 8th, 1815, Gen. Pakenham advanced with 12,000 men against the latter city, which was defended by Gen. Jackson at the head of 6000 militia, chiefly from Tennessee and Kentucky, and aided by a small force of artillery. The Americans were sheltered by a breastwork, and the British assault was met with so deadly a fire of rifle-men that it was repulsed, with the loss of Gen. Pakenham and several officers, with 700 killed and 1000 wounded, while the entire American loss is stated to have only amounted to 71. This ill-planned action was fought more than a month after peace had been concluded between England and America, and was followed by two naval actions in February and March. Though during this contest fortune at first favored the Americans on the high seas, she changed sides completely from June, 1813, as if to counterbalance the disasters of the British on land. On June 1st the *Chesapeake* was taken by the *Shannon*; on June 3d the *Growler* and *Eagle* were captured by British gun-boats; the *Argus* was taken by the *Pelican* on Aug. 14th; the *Essex* by the *Phæbe* and *Cherub* on Mar. 29th, 1814; the *President* by the *Endymion* on Jan. 15th, 1815; the only counterbalancing success being the sinking of the British sloop *Aton* by the *Wasp* on Sept. 8th, 1814. In Dec., 1814, the Federalists of New England held a convention at Hartford in opposition to the war and the administration, and threatened a secession of the New England states. (See HARTFORD CONVENTION.) In 1815, Commodore Decatur, who had taken a distinguished part in the recent war, commanded an expedition against the Algerians, whose corsairs had preyed on American commerce in the Mediterranean, and dictated terms to Algiers, Tunis, and Tripoli.

The treaty of peace with England was announced in February, 1815. The terms did not include the withdrawal of England's claim to search American ships, but none the less, all parties in this country hailed it with delight. With the end of the war, however, came the extinction of the Federalist Party, whose unpatriotic course during the struggle had made its name odious to the nation as a whole. It ceased, therefore, to take any public action, and for a time the country had the singular fortune to find all its citizens of one party, which was an amalgamation of both Federalists and Republicans, with principles derived from both the old party creeds. Perhaps the most marked influence left by the Federalists upon the political tenets of their opponents and upon the popular mind, was to be found in the now very general recognition of the perpetuity of the central government. This national idea had sustained the Republicans in the more liberal view which the war had compelled them to take of the inherent powers of the Federal government, and it became more apparent as time went on in the formation of a new party, known as the Whig Party led by Henry Clay, which





advocated a protective tariff, public improvements at the nation's expense, and a more aggressive foreign policy. But for the moment, the close of Madison's administration found the country, as a whole, scarcely divided by party differences, so that the presidential election of November, 1816, resulted in the choice of James Monroe, of Virginia, as President, and Daniel D. Tompkins, of New York, as Vice-President. These candidates received 183 electoral votes, while the votes of only three states—Massachusetts, Connecticut, and Delaware—were cast for the Federalist candidate, Rufus King, of New York. The Federalists made no formal nomination for the office of Vice-President.

VIII and IX. ADMINISTRATION OF JAMES MONROE (1817–1825). *Cabinet.*—*Secretary of State*, John Quincy Adams, Massachusetts, March 5th, 1817. *Secretary of Treasury*, William H. Crawford, continued. *Secretary of War*, George Graham, Virginia, April 7th, 1817; John C. Calhoun, South Carolina, October 8th, 1817. *Secretary of Navy*, B. W. Crowninshield, continued; Smith Thompson, New York, November 9th, 1818; John Rogers, Massachusetts, September 1st, 1823; Samuel L. Southard, New Jersey, September 16th, 1823. *Attorney-General*, Richard Rush, continued; William Wirt, Virginia, November 13th, 1817. *Postmaster-General*, R. J. Meigs, continued; John McLean, Ohio, June 26th, 1823.

The period of Mr. Monroe's term of office has been known in the annals of American political history as the Era of Good Feeling. Party questions were in abeyance, and when in May, 1817, the President began an extended tour in the Northern States, the warmth of the welcome given him by all classes of the people, showed that the nation was contented, prosperous, and loyal. On Dec. 10th of the same year, Mississippi was admitted to the Union. In accordance with the recommendations of the President's first message, the slightly protective tariff of 1816 was continued for seven years. (See *TARIFF*.) In 1818 (Dec. 3d) Illinois became a state, and on Feb. 22, 1819, the United States purchased of Spain the territory of Florida for \$5,000,000, besides abandoning all claim to the province west of the Sabine River, and afterwards known as Texas. At about the same time the people of the territory of Missouri which had been included in the purchase of Louisiana, applied for admission to the Union. A bill providing for such admission was framed, but amended in the House in such a way as to forbid slavery in the new state. As so amended, the bill passed the House by the votes of the members from the Free States, but was defeated in the Senate, where the Slave States had a controlling majority. This action brought the question of slavery prominently into the sphere of national politics, never again to disappear until the extinction of that institution as the result of the war between the states in 1861–65.

In 1819 (Dec. 14th) Alabama was admitted to the Union, and at the same session of Congress a protective tariff was passed by the House, but defeated in the Senate. The question of the admission of Missouri was again brought forward, coupled with the question of the admission of Maine. An arrangement known as the "Missouri Compromise" was effected (1820), by the action of Mr. Clay and the conservative members of both sections. This measure provided that Maine and Missouri should be voted upon separately, that slavery should be permitted in Missouri; but that for the future, slavery should not exist in new states lying north of the line of 36° 30'. Thirty-five Southern members who believed that Congress had no power to forbid slavery in the territories, voted against the Missouri Compromise, which nevertheless passed both Houses and became a law. Both Maine and Missouri were then admitted as states. In 1820 the presidential campaign resulted in the re-election of Messrs. Monroe and Tompkins, Monroe receiving all the electoral votes but one, which was cast for John Quincy Adams, of Massachusetts. Tradition says that this one vote was so given in order that Washington might be the only President to be unanimously elected.

In 1821 the Strict Constructionists defeated bills looking to a national canal system and a higher tariff; and the President vetoed an act for the preservation of the Cumberland National Road. In 1823, in his message to Congress, Mr. Monroe in mentioning the war then waging by Spain against her rebellious colonies in South America and Mexico, promulgated the famous declaration that has since been known as the Monroe Doctrine, in asserting that, as the United States would interfere in no European war, so would they allow no European power to gain a controlling influence in this hemisphere. In 1824 the party of Loose Constructionists being in a majority in both Houses, adopted a more strictly protective tariff, framed with the design of excluding foreign competitors from American markets. A bill for taking surveys for a national canal system also became a law.

As there were still no definitely organized political parties, the presidential election of 1824 was a personal contest. When the electoral votes were counted (Feb., 1825), 92 were for Andrew Jackson, of Tennessee, 84 for John Quincy Adams, of Massachusetts, 41 for William H. Crawford, of Georgia, and 37 for Henry Clay, there being no choice for President. By a coalition of the supporters of Clay and Adams, the latter was chosen in the House of Representatives, the vote being by states, and Adams receiving the votes of 13 states, while Jackson had those of 7, and Crawford those of 4. The electors had chosen John C. Calhoun, of South Carolina, to be Vice-President, by a vote of 182 to 78 for various other candidates.

X. ADMINISTRATION OF JOHN QUINCY ADAMS (1825–1829). *Cabinet.*—*Secretary of*

State, Henry Clay, Kentucky, March 7th, 1825. *Secretary of Treasury*, Richard Rush, Pennsylvania, March 7th, 1825. *Secretary of War*, James Barbour, Virginia, March 7th, 1825; Peter B. Porter, New York, May 26th, 1828. *Secretary of Navy*, S. L. Southard, continued. *Attorney-General*, William Wirt, continued. *Postmaster-General*, John McLean, continued.

A new division of the American people into parties dates from the beginning of this administration. The party previously known as Republicans or Republican-Democrats soon took the name of Democrats, while the Clay and Adams factions, who had been identified with the doctrine of Loose Constructions, after taking the name of National Republicans, changed it before long to that of Whigs, by which the party continued to be known for thirty years.

Owing to the determined obstruction which was made by the Democrats to the measures proposed by the supporters of the administration, few of them were successfully carried. In July, 1827, a National Convention of Protectionists at Harrisburg, Penn., advocated a strongly protective policy, and in 1828 a tariff framed in accordance with these views, became law. The South, being an agricultural rather than a manufacturing community, denounced this measure as being sectional legislation, intended to benefit New England and the Middle States at the expense of the South. Hence, the doctrine of Nullification, which had been promulgated in the Kentucky Resolutions of 1798, was revived, and began to be generally accepted in the Southern States. In 1828, the Democratic candidate for President, Andrew Jackson, of Tennessee, received 178 electoral votes to 83 cast for John Quincy Adams. John C. Calhoun was re-elected Vice-President, having 171 electoral votes.

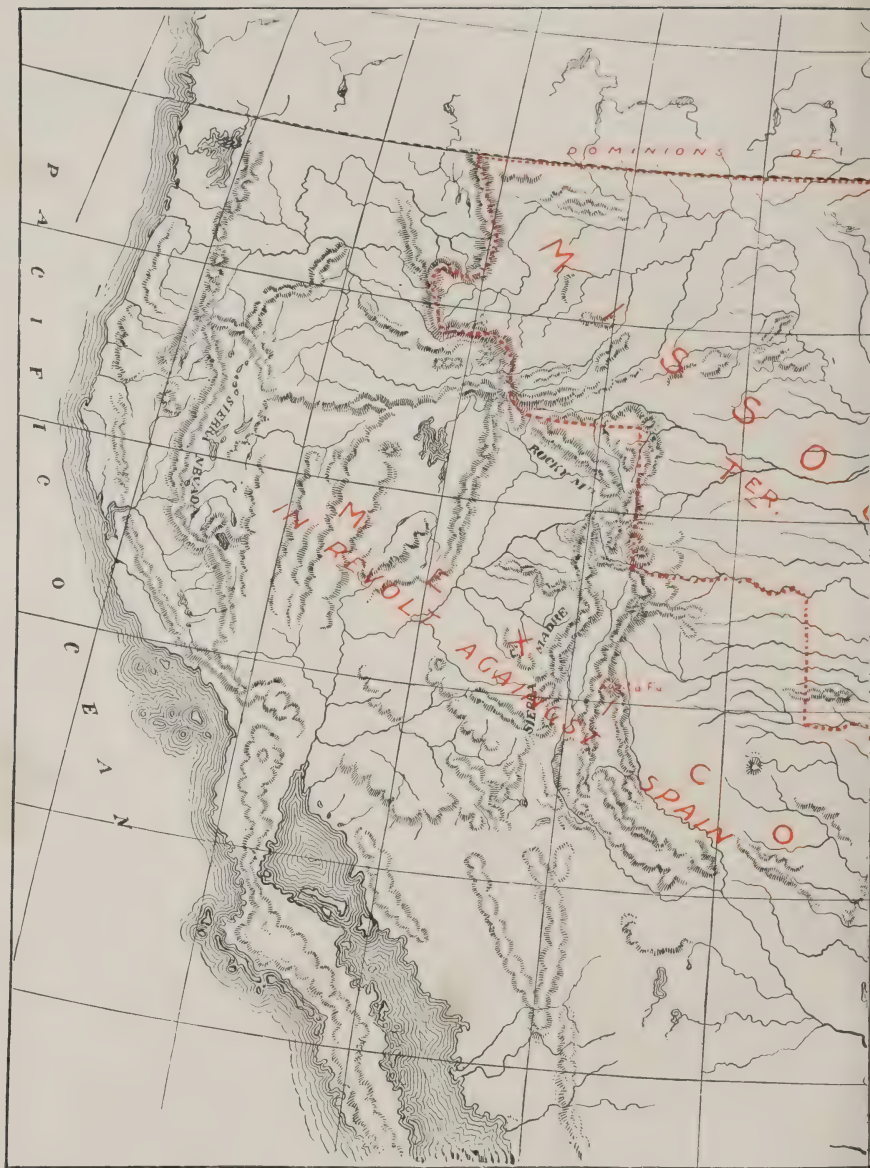
XI. and XII. ADMINISTRATION OF ANDREW JACKSON (1829-1837). *Cabinet*.—*Secretary of State*, Martin Van Buren, New York, March 6th, 1829; Edward Livingston, Louisiana, May 24th, 1831; Louis McLane, Delaware, May 29th, 1833; John Forsyth, Georgia, June 27th, 1834. *Secretary of Treasury*, Samuel D. Ingham, Pennsylvania, March 6th, 1829; Louis McLane, Delaware, August 8th, 1831; William J. Duane, Pennsylvania, May 29th, 1833; Roger B. Taney, Maryland, September 23d, 1833; Levi Woodbury, New Hampshire, June 27th, 1834. *Secretary of War*, John H. Eaton, Tennessee, March 9th, 1829; Lewis Cass, Michigan, August 1st, 1831; Benjamin F. Butler, New York, March 3d, 1837. *Secretary of Navy*, John Branch, North Carolina, March 9th, 1829; Levi Woodbury, New Hampshire, May 23d, 1831; Mahlon Dickerson, New Jersey, June 30th, 1834. *Attorney-General*, John M. Berrien, Georgia, March 9th, 1829; Roger B. Taney, Maryland, July 20th, 1831; Benjamin F. Butler, New York, November 15th, 1833. *Postmaster-General*, William T. Barry, Kentucky, March 9th, 1829; Amos Kendall, Kentucky, May 1st, 1835.

The bold, decisive, and impetuous character of Gen. Jackson was shown in a general removal of those who had held office, down to small postmasters and tidewaiters, under the late administration, and the appointment of his own partisans. An act for the rechartering of the United States Bank was met by a veto of the President, who declared it unconstitutional and dangerous. In 1832 an Indian war, called the Black Hawk War, broke out in Wisconsin, but the passing of a high protective tariff act by Congress caused a more serious trouble. The state of South Carolina declared the act unconstitutional, and therefore null and void, threatening to withdraw from the Union if an attempt were made to collect the duties on foreign importations. The President prepared to execute the laws by force; Mr. Calhoun resigned his office of Vice-President and asserted the doctrine of state rights, including the right of secession, in the Senate. A collision seemed imminent, but the affair was settled by a compromise bill, introduced by Henry Clay, providing for a gradual reduction of duties until 1843, when they should not exceed 20 per cent. *ad valorem*.

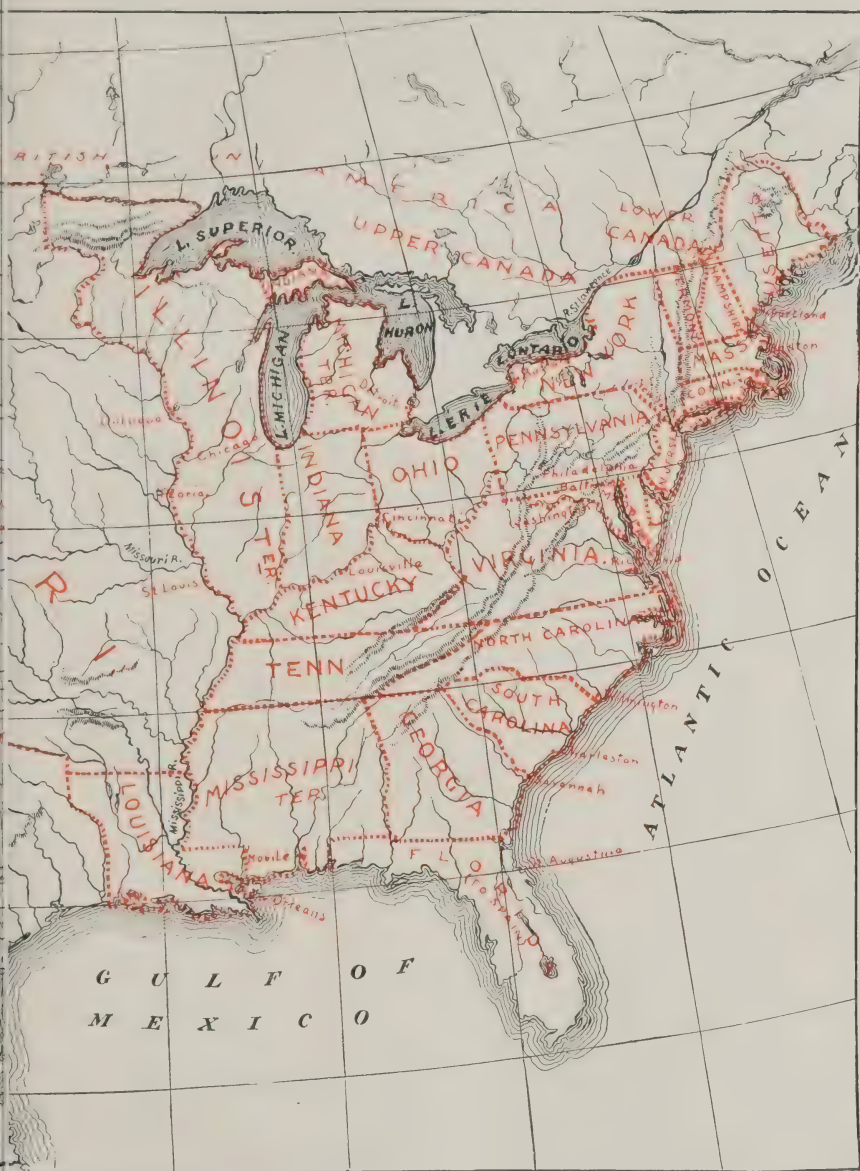
During the first administration of Gen. Jackson occurred the famous debate (Feb., 1830) in the Senate between Daniel Webster of Massachusetts and Robert Y. Hayne of South Carolina, in which the two opposing views regarding slavery, nullification, and the true interpretation of the Constitution were advocated and discussed with such eloquence, learning, and enthusiasm as to make the debate an epoch in the constitutional development of the United States. The same period witnessed the rise of the Anti-Masonic Party. In 1826, one William Morgan, of Batavia, N. Y., who had written a book exposing the secrets of Free Masonry, disappeared and was never again seen. It was asserted that he had been kidnapped and murdered by the Free Masons; and a political party arose, pledged to oppose the election of Free Masons to political office.

The Presidential election of 1832 resulted in the reappointment of Jackson as President. He received 219 electoral votes, as against 49 for Henry Clay, 11 for John Floyd, of Virginia, and 7 for William Wirt, of Virginia. Martin Van Buren, who received 189 votes, was elected Vice-President.

The removal by order of the President of the government deposits from the United States Bank to certain state banks, led to the failure of the Bank, and, after some years, to the adoption of Mr. Van Buren's plan of an independent treasury. The Cherokee Indians in Georgia, who had attained to a certain degree of civilization, appealed to the President for protection against the seizure of their lands by the state; but they were told that he "had no power to oppose the exercise of the sovereignty of any state over all who may be within its limits;" and the Indians were obliged to remove to the ter-



The United S



tes in 1816.

ritory set apart for them west of the Mississippi. In 1835, the Seminole war broke out in Florida, and a tribe of Indians, insignificant in numbers, under the crafty leadership of Osceola (q.v.), kept up hostilities for years, at a cost to the United States of several thousands of men and some \$50,000,000. In 1833, the Senate which was controlled by the Whig Party led by Henry Clay, took the extraordinary step of passing formal resolutions of censure, in which the President was condemned for his order removing the government deposits from the Bank. The President protested against the resolutions of censure as being an indirect and illegal form of impeachment, and one against which he had no means of defense. This protest was, however, not allowed by the Senate to appear upon the record. The warfare between the President and Senate continued through the next two years, the latter frequently rejecting the nominations made by the Executive. In 1835 (Dec. 7th), the President announced to Congress that the national debt would soon be paid, and that provision should be made for the surplus revenue which was anticipated. In June, 1836, a bill was passed providing that after Jan. 1st, 1837, any surplus exceeding the sum of \$500,000,000 should be divided among the states as a loan, subject to a recall by Congress. In accordance with this act, some \$28,000,000 was divided in 1837, and has never yet been recalled. In July, 1836, the President caused the famous Specie Circular to be issued, which ordered the agents of the government to receive only gold or silver in payment for public lands. The sudden demand for specie which this order produced led to financial disturbances, culminating in the disastrous financial crisis known as the "Panic of 1837." In the same year the Senate, which had at last become Democratic, voted to expunge from its records the resolutions of censure already mentioned. The Mexican state of Texas, which had been colonized by Americans, was at this time endeavoring to shake itself free from Mexican control and to establish its independence. The South saw in this movement a prospect of annexing this large territory once more to the United States, and of carving from it new Slave States whose votes in the Senate would counterbalance those of the new Free States. Many manifestations of sympathy with the Texans were therefore made, and a resolution recognizing the independence of Texas passed the Senate but not the House. The Slavery question was now revived with much vigor. In 1833, the National Anti-Slavery Society had been formed, and from about this time we must date the formation of the Anti-Slavery Party, soon to be known as Abolitionists, later as Free Soilers, and finally as Republicans. Arkansas (June 15th, 1836) and Michigan (Jan. 26th, 1837) were admitted to the Union. The election of 1836 resulted in the success of the Democratic party, whose candidate for President, Martin Van Buren, of New York, received 170 electoral votes, against 73 for William Henry Harrison, of Indiana, and 51 scattering. No candidate for Vice-President received a clear majority, and so the choice fell to the Senate, which elected Richard M. Johnson, of Kentucky.

XIII. ADMINISTRATION OF MARTIN VAN BUREN (1837-1841). *Cabinet*.—*Secretary of State*, John Forsyth, continued. *Secretary of Treasury*, Levi Woodbury, continued. *Secretary of War*, Joel R. Poinsett, South Carolina, March 7th, 1837. *Secretary of Navy*, Mahlon Dickerson, continued; James K. Paulding, New York, June 25th, 1838. *Attorney-General*, Benjamin F. Butler, continued; Felix Grundy, Tennessee, July 5th, 1838; Henry D. Gilpin, Pennsylvania, January 11th, 1840. *Postmaster-General*, Amos Kendall, continued; John M. Niles, Connecticut, May 19th, 1840.

Mr. Van Buren, in accordance with his pledges, carried out and perpetuated the policy of his predecessor. As that policy on its financial side led to the panic of 1837 (May), the new administration was unfortunate in its beginnings. No such general financial disaster had until then been known in the United States. A suspension of specie payments occurred throughout the country, even in New York. Many banks suspended altogether, and innumerable corporations and individuals were ruined. Congress authorized the issue of \$10,000,000 in treasury notes, and gave merchants an extension of time on their revenue bonds. In December of the same year, the Specie Circular was canceled. The first important contested election question occurred at the session of Congress beginning Dec. 2d, 1839. Five Whig congressmen from New Jersey, where all congressmen were then elected on a general ticket, had received certificates of election from the state authorities. Their right was, however, contested by five Democrats on the ground of an alleged miscount in one county. On the discussion of this question rested the political complexion of the House, so narrow was the margin between the two parties. An exciting contest from December to March (1840) resulted in seating the Democrats. All these incidents hurt the dominant party in the country at large, so that in the campaign of 1840, the candidacy of the Whig nominee, Gen. William Henry Harrison, of Virginia, was supported with an enthusiasm such as no subsequent political campaign has ever witnessed. It has become known as the Log Cabin Campaign or the Hard Cider Campaign—log cabin and hard cider being taken as typifying the homely simplicity of Gen. Harrison's frontier life. The "Liberty Party," or Abolitionists, also made nominations, their candidates being James G. Birney, of New York, for President, and Francis Lemoyne, of Pennsylvania, for Vice-President. The Democrats renominated Mr. Van Buren and Mr. Johnson. Gen. Harrison received 234 electoral votes, to 60 for Mr. Van Buren; and for Vice-President, the Whig, John Tyler, of Virginia, received 234 against 48 for Mr. Johnson, and 12 scattering.

XIV. ADMINISTRATION OF WILLIAM HENRY HARRISON (1841) AND OF JOHN TYLER

(1841-1845). *Cabinet*.—*Secretary of State*, Daniel Webster, Massachusetts, March 5th, 1841; Hugh S. Legare, South Carolina, May 9th, 1843; A. P. Upshur, Virginia, July 24th, 1843; John C. Calhoun, South Carolina, March 6th, 1844. *Secretary of Treasury*, Thomas Ewing, Ohio, March 5th, 1841; Walter Forward, Pennsylvania, September 13th, 1841; John C. Spencer, New York, March 3d, 1843; George M. Bibb, Kentucky, June 15th, 1844. *Secretary of War*, John Bell, Tennessee, March 5th, 1841; John McLean, Ohio, September 13th, 1841; John C. Spencer, New York, October 12th, 1841; James M. Porter, Pennsylvania, March 8th, 1843; William Wilkins, Pennsylvania, February 15th, 1844. *Secretary of Navy*, G. E. Badger, North Carolina, March 5th, 1841; A. P. Upshur, Virginia, September 13th, 1841; David Henshaw, Massachusetts, July 24th, 1843; T. W. Gilmer, Virginia, February 15th, 1844; John Y. Mason, Virginia, March 14th, 1844. *Attorney-General*, John J. Crittenden, Kentucky, March 5th, 1841; Hugh S. Legare, South Carolina, September 13th, 1841; John Nelson, Maryland, July 1st, 1843. *Postmaster-General*, Francis Granger, New York, March 6th, 1841; Charles A. Wickliffe, Kentucky, September 13th, 1841.

Two weeks after his inauguration, President Harrison issued a proclamation calling an extra session of Congress to consider the financial distress prevailing throughout the country, and the like questions that beset the government itself. The extra session was called for May 31st, but on April 4th, the President died after a short illness—the first of our chief magistrates to die in office. The Vice-President therefore succeeded to the presidential chair, retaining his predecessor's cabinet. When Congress met in accordance with Gen. Harrison's call of March 17th, the Whigs, who had a majority in both houses, began to carry out the changes to which their party had pledged itself in the campaign of the preceding year. A bill was passed for the incorporation of a new United States Bank somewhat after the model of that which had been so vigorously attacked by President Jackson. To the consternation of the Whigs, the new President promptly vetoed it as being unconstitutional. The leading members of the party then conferred with Mr. Tyler and asked him to suggest the provisions of a bill that he would be willing to accept. He agreed to do so, yet after the bill of his own framing had passed the two Houses it met the fate of the former act. It now became evident that the President was at heart a Democrat, and that his political principles would prevent him from acting cordially with the party that had elected him to office. The indignation and chagrin of the Whigs were unbounded. The entire cabinet, with the exception of Secretary Webster, immediately resigned. The leaders of the Whig party issued a manifesto "reading" the President out of the party, and holding him responsible for the failure to effect the reforms that had been promised.

President Tyler immediately filled the places in his cabinet with conservative politicians; and having been cut off from political affiliation with his own party, turned to the Democrats for support. The session of Congress beginning Dec. 6th, 1841, was made noteworthy by the refusal of that body to receive petitions for the abolition of slavery. In March, 1842, Joshua Giddings, of Ohio, offered resolutions declaring that slavery exists only by the force of municipal law; and that in consequence, ownership based upon it cannot be enforced beyond the territory and jurisdiction of the power that established it. These resolutions looked to the denial of property in slaves in the territories, and for offering them, Mr. Giddings was censured by the House, resigned his seat, and was instantly re-elected by his constituents.

In 1843, the government arranged a treaty with the new republic of Texas, providing for the future annexation of that country to the United States. The Senate rejected this treaty by a vote of 35 to 16, seven Democrats voting with the Whigs for rejection. This question at once sprang to the front in all political discussion.

The desire for the annexation of Texas was very strong among the southern leaders. Up to this time the admission of a free state had been balanced by the admission of a slave state, and as all the states had equal representation in the Senate the balance of power between the sections was fairly well preserved. But the supply of territory from which future slave states might be carved was now exhausted, while in the Northwest there still remained the material for several free commonwealths. To maintain the *status quo*, the annexation of Texas became an actual necessity to those who watched over the interests of the South; for should the Free States ultimately acquire a dominant power in the Senate, as they had already done in the House, the time might come when the existence of slavery would be imperilled. The possibility of this was kept continually before the southern mind by the increasing activity at the North of the Liberty Party, which in 1843 held a national convention at Buffalo and there put forth a series of resolutions denouncing slavery, and calling on the Free States to pass penal laws to prevent the return of fugitive slaves. It also nominated James G. Birney, of Michigan, as its candidate for the presidency. The Whigs at their convention held at Baltimore in May, 1844, nominated Henry Clay, of Kentucky, with Theodore Frelinghuysen, of New York, as the candidate for Vice-President. The Democratic convention, in the same month, nominated James K. Polk, of Tennessee and George M. Dallas, of Pennsylvania. The platform called for the annexation of Texas. The election in November resulted in the choice of Polk and Dallas after a very close contest in which the Democrats succeeded only by the fact that several thousand votes in New York were cast for the abolition ticket. At the next session of Congress (Dec., 1844) a joint resolution for the



annexation of Texas was passed by both Houses and approved by the President. It renewed the Missouri Compromise as regards the Texan territory north of the compromise line, and as to the territory south of that line the question was left to the decision of the inhabitants of the future states.

An important event in the history of Mr. Tyler's administration is the conclusion of the so-called Ashburton Treaty between the United States and Great Britain (1842). Many subjects of dispute had arisen between the two countries, so that their relations had become more and more unfriendly. During an insurrection in Canada in 1837 a party of supporters of the Canadian government had crossed over to the American bank of the St. Lawrence and destroyed a vessel, the *Caroline*, owned by the friends of the insurgents. In the affair one American had been killed. Again, in 1841, an American vessel, the *Creole*, was sailing from Richmond to New Orleans with a cargo of slaves, when the slaves rose, seized the vessel, and took her into the British port of New Providence in the Bahamas. The authorities there assisted the slaves to escape. Thus, each nation was furnished with a grievance against the other, and such ill-feeling resulted that serious fears of war were entertained.

Fortunately Mr. Webster, who was Tyler's Secretary of State, was liked and respected by English statesmen; and in 1842 Lord Ashburton was sent out from England to negotiate a treaty. An important point to be settled was the boundary between Canada and the Northern States. A difficulty occurred which often meets our government in its dealings with foreign nations in the matter of territory. The question affected, not merely the whole American Union, but more especially the states of Maine and Massachusetts, to which the territory in dispute would belong. These states might reasonably suspect that their special interest would be sacrificed to that of the Union. The matter, however, was settled by a compromise. Great Britain gave up the larger and more valuable share of the disputed territory, and the United States government paid a sum of \$250,000 to the states of Maine and Massachusetts to make up for the loss of the rest. Two other points of importance were settled by this treaty. One was the suppression of the slave trade by the two governments. The other was the mutual surrender of criminals. This was beset by some difficulty. The United States desired that this arrangement should include fugitive slaves, a point on which the English government was resolved not to yield and which the United States ultimately withdrew. When Lord Ashburton had been satisfied on this point, the treaty was signed in August, 1842. Both in England and America, fault was found with the provisions of the treaty as giving too much to the other side; but Mr. Webster and the other defenders of the treaty appealed to this fact as a proof of its essential fairness.

XV.—ADMINISTRATION OF JAMES K. POLK. (1845-1849). *Cabinet*.—*Secretary of State*, James Buchanan, Pennsylvania, March 6th, 1845. *Secretary of Treasury*, Robert J. Walker, Mississippi, March 6th, 1845. *Secretary of War*, William L. Marcy, New York, March 6th, 1845. *Secretary of Navy*, George Bancroft, Massachusetts, March 10th, 1845; John Y. Mason, Virginia, September 9th, 1846. *Attorney-General*, John Y. Mason, Virginia, March 5th, 1845; Nathan Clifford, Maine, October 17th, 1846. *Postmaster-General*, Cave Johnson, Tennessee, March 6th, 1845.

As soon as the new administration came into office, United States troops under General Taylor were sent to the Nueces River, a point beyond the proper boundary of Texas. In the mean time, both the Texan Congress and a convention of the people had ratified the act of annexation. On Dec. 29th, 1845, Texas formally entered the Union. Up to this date, Mexico, being distracted by revolutions, had simply protested against the action of the United States and had recalled her Minister from Washington; but in March 1846, the further advance of General Taylor brought United States troops into conflict with a superior force of Mexicans at Palo Alto. The Mexicans were severely defeated in two battles, the second being at Resaca de la Palma (May 8th and 9th).

On the 11th of May, 1846, news of hostilities having reached Washington, the President officially informed Congress of the occurrence and asked that war be declared. Both Houses responded to the message and to the awakened war-spirit of the country by passing a bill whose preamble began as follows: "Whereas, by the act of Mexico, a state of war exists between that government and the United States"—a statement that provoked much criticism from the opponents of the administration, as false, in view of the fact that hostilities had been precipitated by the military occupation of territory claimed by Mexico. The bill appropriated \$10,000,000 for the prosecution of the war; and under it enlistment was actively begun. Volunteers to the number of 50,000 men were authorized.

Whatever view one may take of the political aspect of the war, the brilliant series of victories won by the armies of the United States, must always evoke a thrill of pride in every patriotic American. Against forces that outnumbered them, sometimes four to one and not inferior in training, in a hostile country, and against formidable obstacles both natural and artificial, the troops of Scott and Taylor, won triumph after triumph by dint of the most splendid courage and the most stubborn fighting.

On May 15th, Gen. Winfield Scott had completed his plans for the invasion and conquest of Mexico. They involved three distinct operations. A powerful fleet was to round Cape Horn and sweep down upon the Pacific coast of Mexico; an army was to be assembled at Fort Leavenworth with New Mexico and the Pacific provinces for its

object of attack in co-operation with the fleet ; while a second army was to be massed at San Antonio de Bexar in Texas, to penetrate the heart of Mexico by invasion from the North. On May 23d, the Mexican republic formally declared war upon the United States.

For some time after the declaration, hostilities were carried on with brilliant success by Gen. Taylor. Crossing the Rio Grande, he had already hurled his army upon the Mexicans in the city of Matamoras and had driven them from it on the 18th of May. In August, having received re-enforcements, he prepared for a march of conquest into the interior of the country. The first division of his army under Gen. William J. Worth moved upon the strongly defended city of Monterey (Aug. 20th) while Taylor himself, with 6000 men, followed a few days later. The forces united on Sept. 19th, within three miles of the city where the Mexican general, Ampudia, with nearly 10,000 troops, lay in waiting behind powerful fortifications. On Sept. 21st, Gen. Taylor invested the town ; on the fourth day after an assault, distinguished by the most stubborn fighting in the streets, Ampudia surrendered ; and after some minor operations in which Taylor was aided by a second army under Gen. Wool, acting in conjunction with his own, the city of Tampico yielded to the American fleet under Commodore Connor.

In January, 1847, Gen. Scott arrived with a fleet and an army off the fortress of Vera Cruz. To aid this force, a large number of Taylor's troops were detached and ordered to the coast. This left Taylor himself with only 5000 men, of whom but 500 were regular troops. The ablest of the Mexican generals, Antonio Lopez de Santa Anna (q.v.), learning of the depletion of Taylor's army, marched rapidly upon him with 20,000 men, the flower of the Mexican army. Taylor did not shrink from the unequal encounter. Falling back to the mountain pass of Buena Vista, he made his dispositions for battle, and rejecting Santa Anna's demand for his instant capitulation, faced the enemy on the anniversary of the birthday of Washington. Some preliminary manœuvring on the afternoon of the 22d, was followed by a combined assault upon the American lines on the morning of the 23d. Again and again the superior numbers of the Mexicans seemed certain to overwhelm the little force that fronted them ; but the desperate fighting of the Americans whom Taylor commanded in person, and the superior service of the American artillery under Bragg, Washington, and Sherman, beat back the assault until nightfall, when the Mexicans withdrew defeated, leaving the northern province in the control of the invading troops. In September, Gen. Taylor returned to the United States, leaving Gen. Wool in command, while Scott directed the general operations of the whole campaign.

The commander-in-chief had appeared before Vera Cruz on the 9th of March. This place was very strongly fortified, but the Americans were allowed to land unresisted. They threw up earthworks and opened fire on the place from sea and land. After a four days' bombardment, to which the besieged made an ineffectual reply, the place surrendered. Scott then marched inland and utterly defeated Santa Anna, who had taken up a strong position at Cerro Gordo. The Americans then advanced unchecked to within fifteen miles of the city of Mexico. Here the most serious operations began. At the time of the Spanish conquest the city of Mexico had been surrounded by a lake. This was drained by Cortez, and the city consequently now stood in the middle of a valley. The approaches to it were guarded by a number of strong fortresses ; and a canal, forming a moat, belted the city. One by one these outlying fortifications were captured, and on the 14th of September the American army fought its way into the capital. After this the Mexicans made no further resistance.

In the meantime, the army assembled at Fort Leavenworth under Gen. Stephen W. Kearney, had marched into New Mexico and secured possession of the country without resistance, while Lieut. Col. Frémont, with a force of volunteers operating in conjunction with the Pacific squadron under Commodore Sloat, had secured California, after defeating a Mexican army under Gen. Castro at Sonoma Pass (June 15th, 1846). On Feb. 8th, 1847, Frémont proclaimed at Monterey, the annexation of California to the United States.

Another successful expedition was that of Col. Doniphan who in 1846 with a thousand volunteers from Missouri had been sent by Gen. Kearney to effect a junction in Chihuahua with Gen. Wool. At Braceti he was intercepted by a large force of Mexicans under Gen. Ponce de Leon (Dec. 22d), who sent them a black flag with the message, " We neither ask quarter nor grant it." Doniphan in a sharp encounter drove this army before him after inflicting severe losses upon it, and was equally successful against a second army of 4000 Mexicans on Feb. 28, 1847, whom he utterly routed, and took possession of the city of Chihuahua March 2d.

On the 2d of February, 1848, peace was signed at Guadalupe Hidalgo. Mexico resigned her claim to Texas, and also handed over New Mexico and California to the United States for a payment of \$15,000,000. By far the most important part of the acquisition was California. This gave the United States the Pacific as well as the Atlantic seaboard. In fact, it may be looked on as, in some sort, the completion of that great westward movement which had been going on during the whole of the century. The possession of California made it certain that the American people must in time form one continuous community across the whole continent of America.

Other important events of Mr. Polk's administration were the treaty with England

(June 15th, 1846) by which the long-disputed question of the northwest boundary was settled; the so-called "Tariff of 1846," which limited its purpose to the collection of revenues alone, without protection to native industries; the admission of Iowa (Dec. 28th, 1846); the establishment of the new territory of Oregon without slavery, and the admission of Wisconsin (May 29th, 1848).

The opposing candidates at the presidential election of 1848 were Lewis Cass, of Michigan and William O. Butler, of Kentucky, Democrats, against Gen. Zachary Taylor, of Louisiana and Millard Fillmore, of New York, Whigs. The Free Soil Party nominated Martin Van Buren, of New York and Charles Francis Adams, of Massachusetts. Taylor and Fillmore received 163 electoral votes as against 127 cast for Cass and Butler.

XVI. ADMINISTRATION OF ZACHARY TAYLOR (1849-1850) AND OF MILLARD FILLMORE (1850-1853). *Cabinet.*—*Secretary of State*, John M. Clayton, Delaware, March 7th, 1849; Daniel Webster, Massachusetts, July 22d, 1850; Edward Everett, Massachusetts, December 6th, 1852. *Secretary of Treasury*, W. M. Meredith, Pennsylvania, March 8th, 1849; Thomas Corwin, Ohio, July 23d, 1850. *Secretary of War*, George W. Crawford, Georgia, March 8th, 1849; Winfield Scott (*ad interim*), July 23d, 1850; Charles M. Conrad, Louisiana, August 15th, 1850. *Secretary of Navy*, William B. Preston, Virginia, March 8th, 1849; William A. Graham, North Carolina, July 22d, 1850; J. P. Kennedy, Maryland, July 22d, 1852. *Secretary of Interior*, Thomas H. Ewing, Ohio, March 8th, 1849; A. H. H. Stuart, Virginia, September 12th, 1850. *Attorney-General*, Reverdy Johnson, Maryland, March 8th, 1849; John J. Crittenden, Kentucky, July 22d, 1850. *Postmaster-General*, Jacob Collamer, Vermont, March 8th, 1849; Nathan K. Hall, New York, July 23d, 1850; S. D. Hubbard, Connecticut, August 31st, 1852.

The course of American political history from the beginning of this administration down to the civil war, shows a gradual disintegration of the old Whig party, the increase in importance of the Free Soil movement, and the development of the Democratic Party into an organization whose first and foremost object was the maintenance of slavery and the perpetuation of the political power of the Slave States. The increase of territory out of which new states might be created made the South anxious to prevent these new states from inhibiting slavery, as would probably be done in some of them, especially in California, if the question were left to the inhabitants. There were various circumstances which made the South especially anxious that slavery should be admitted into California. They believed that, once admitted, it would become permanent, and that California would be added to the number of the Slave States. Moreover, the hostility to slavery was growing stronger in the North. The Northern states were showing themselves backward in helping the South to recover runaway slaves. Furthermore, two Free States, Wisconsin and Iowa, had been lately added to the Union; and the Slave States were anxious to recover the influence which had thus been lost. Hitherto they had taken up the ground that slavery was a question to be dealt with by each state for itself. Now they changed their ground, and declared that it was unjust to allow the government of any state or territory to prevent any citizen of the United States from emigrating with his property, that is to say, his slaves, into the newly-acquired lands. The contest had begun in 1846, while the acquisition of the land in question was still doubtful. In that year, David Wilmot, of Pennsylvania, brought forward a motion, providing that slavery should be excluded from all territories acquired by treaty. This, commonly called the "Wilmot Proviso," was carried in the House of Representatives, but defeated in the Senate. Next year it was again proposed with a like result. Mr. Calhoun met it by a series of resolutions, declaring that any such measure would deprive the slave-holding states of their rights, and would tend to subvert the Union. So fierce did the strife become, that many of the most thoughtful statesmen began to fear separation or a civil war. In this crisis Mr. Clay, now a man of seventy-two and in broken health, came forward as a peace-maker. Like Webster, who now supported him, Mr. Clay had always held a moderate position between the two extreme parties. His proposal was that the question of slavery in California and in the new territories should be left to the local governments; a principle that came to be known as "Squatter Sovereignty." This was a concession to the South in the matter of the Territories; to the North in the matter of California, whose inhabitants were known to be opposed to slavery. He also proposed that the inland slave-trade should be abolished in the District of Columbia, but that provision should be made for the stricter enforcement of the law for recovering runaway slaves in the Free States. The success of this scheme, called Clay's Omnibus Bill, or the Compromise Measures (q.v.) which afterwards became the subject of separate bills, was largely due to the vigorous support given it by Daniel Webster, whose speech, delivered in the Senate on March 7th, 1850, eloquently set forth the constitutional obligation of the North to allow the return to the South of fugitive slaves. At the same time Mr. Webster recurred with all his old fire and force to the paramount necessity of preserving the Union. This remarkable speech seriously impaired the orator's popularity at the North, and his motives at the time were impeached; but there is no reason to believe that he acted from any than a patriotic and statesmanlike desire to obliterate existing causes of partisan dispute and to unite again the two opposing sections of the country. The passage, however, of a more stringent

law for the recapture of fugitive slaves, excited at the North feelings of horror and disgust. Several of the state legislatures even passed specific laws intended for the protection of negroes.

President Taylor died on the 9th of July, 1850, and was succeeded by Vice-President Fillmore, who strictly carried out the policy of his party so that there was no break in the political continuity of the administration. The Compromise Measures had caused a temporary lull in the contest over the question of slavery. In June, 1852, the two great parties made their presidential nominations. The candidates of the Democracy were Franklin Pierce, of New Hampshire and William R. King, of Alabama. The Whigs nominated Gen. Winfield Scott, of Virginia and William A. Graham, of North Carolina. In August, the Free Soil Party nominated John P. Hale, of New Hampshire and George W. Julian, of Indiana.

The election resulted in the success of the Democratic ticket, which received 254 electoral votes, against 42 cast for the Whig nominees.

XVII. ADMINISTRATION OF FRANKLIN PIERCE (1853-1857). *Cabinet*.—*Secretary of State*, William L. Marcy, New York, March 7th, 1853. *Secretary of Treasury*, James Guthrie, Kentucky, March 7th, 1853. *Secretary of War*, Jefferson Davis, Mississippi, March 7th, 1853. *Secretary of Navy*, James C. Dobbin, North Carolina, March 7th, 1853. *Secretary of Interior*, Robert McClelland, Michigan, March 7th, 1853; Jacob Thompson, Mississippi, March 6th, 1856. *Attorney-General*, Caleb Cushing, Massachusetts, March 7th, 1853. *Postmaster-General*, James Campbell, Pennsylvania, March 7th, 1853.

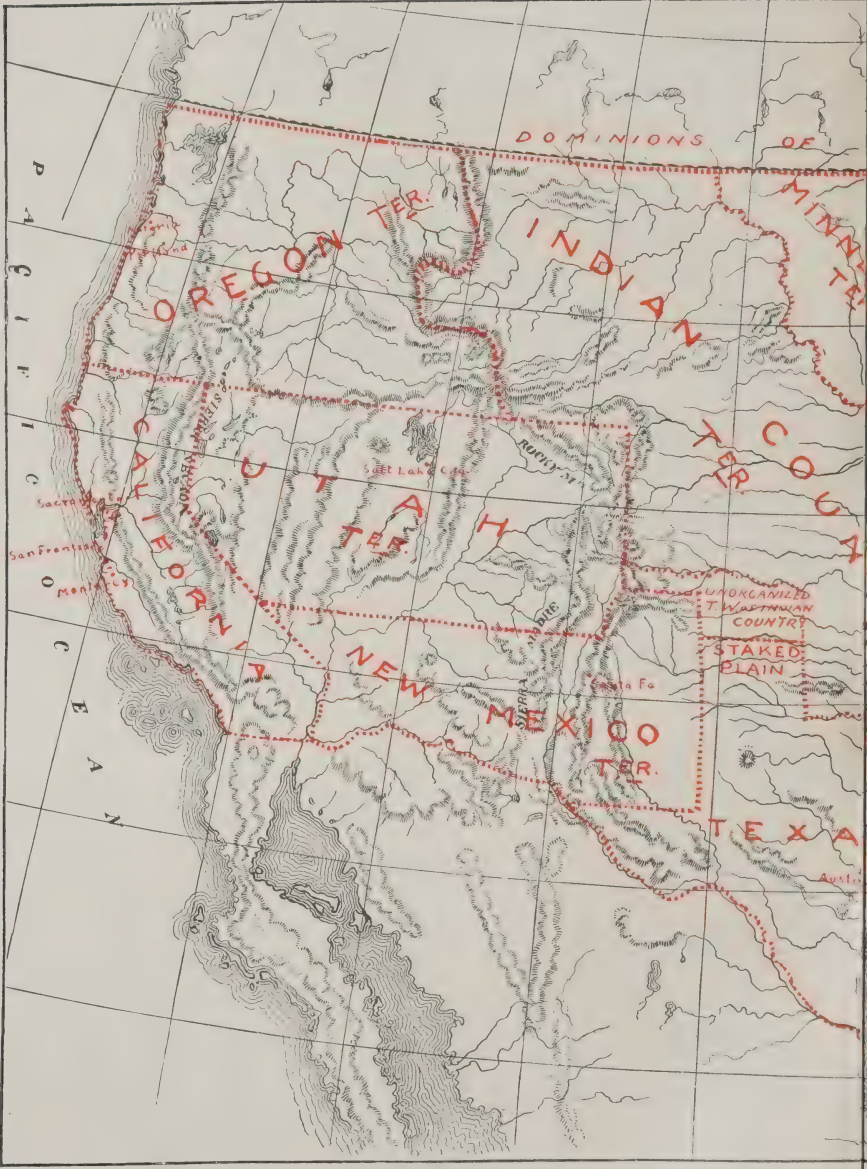
The slavery question soon came once more to the front. In January, 1854, the famous Kansas-Nebraska Bill was introduced into Congress. This divided the territory previously known as Nebraska into two, one between parallels 37° and 40°, to be called Kansas, and the other between 40° and 43°, to be called Nebraska. Both these territories, by the Missouri Compromise of 1820, were barred to slavery; but the bill now introduced, practically proposed to repeal the Missouri Compromise as being unconstitutional in that it had allowed interference with slavery by Congress. The present bill left it to the people of each new territory to say whether or not slavery should be tolerated on its soil. The Senate promptly passed this bill. Two months later it was passed by the House. This marks the final disruption of the old Whig Party, of which many of the Northern members now repudiated the name, and after calling themselves for a time "Anti-Nebraska Men" joined the newly organized Republican Party (1856). The Southern Whigs on the other hand, before long united with the Southern Democrats. At about this time the so-called American Party, or Know-Nothings (q.v.), exercised some influence. It demanded more stringent naturalization laws and the election to high office of none but native-born citizens.

The virtual repeal of the Missouri Compromise, which left the new territories to decide for themselves whether they would admit slavery or not, turned Kansas, as the territory nearest the settled states, into a battle-ground for the two parties. The partisans of the North wished that a majority of the inhabitants should be against slavery; those of the South naturally hoped otherwise. Each kept pouring in fresh emigrants to outnumber the other. At first the South was successful, and a code of laws was established with many and stringent provisions on behalf of slavery. This was brought about, it is said, not by legitimate emigrants, but by a mob of Missourians, with no occupation and no real connection with Kansas, who passed across the border, took possession of the polling places, and carried the elections against the real citizens. A succession of outrages, amounting almost to a civil war on a small scale, followed. Kansas became practically divided into two districts, one for slavery and one against it. Each district established its own government and elected delegates to Congress. On January 24th, 1856, President Pierce sent a special message to Congress recognizing the pro-slavery government, and declaring the action of the Free-Soil government in Kansas to be rebellious. He next issued a proclamation to the same effect, and put United States troops at the disposal of the pro-slavery government. A species of civil war now actually existed in Kansas. The two anti-slavery towns, Lawrence and Ossawatimie, were sacked. The Free-Soil legislature was twice dispersed by Federal troops. In the mean time, public sentiment throughout the country was excited to a still greater intensity by the assault upon Senator Charles Sumner, of Massachusetts, by Mr. Preston S. Brooks, of South Carolina (May 22d, 1856), for utterances on the Kansas question. The House censured Brooks, who at once resigned and was unanimously re-elected by his constituents.

At the presidential election of 1856, the following tickets were in the field: Democratic, James Buchanan, of Pennsylvania and John C. Breckinridge, of Kentucky; Republican, John C. Frémont, of California and William L. Dayton, of New Jersey; Know-Nothing, Millard Fillmore, of New York and A. J. Donelson, of Tennessee. The Democratic ticket received 174 electoral votes; the Republican, 114; the Know-Nothing, 8.

XVIII. ADMINISTRATION OF JAMES BUCHANAN (1857-1861). *Cabinet*.—*Secretary of State*, Lewis Cass, Michigan, March 6th, 1857; J. S. Black, Pennsylvania, December 17th, 1860. *Secretary of Treasury*, Howell Cobb, Georgia, March 6th, 1859; Philip F. Thomas, Maryland, December 12th, 1860; John A. Dix, New York, January 11th.







ates in 1852.

1861. *Secretary of War*, John B. Floyd, Virginia, March 6th, 1857; Joseph Holt, Kentucky, January 18th, 1861. *Secretary of Navy*, Isaac Toucey, Connecticut, March 6th, 1857. *Secretary of Interior*, Jacob Thompson, Mississippi, March 6th, 1857. *Attorney-General*, J. S. Black, Pennsylvania, March 6th, 1857; E. M. Stanton, Pennsylvania, December 20th, 1860. *Postmaster-General*, Aaron V. Brown, Tennessee, March 6th, 1857; Joseph Holt, Kentucky, March 14th, 1859; Horatio King, Maine, February 12th, 1861.

President Buchanan's administration witnessed the culmination of the conflict that had for years been waged between the Free and the Slave States in the political arena. The elements of disorder, of dissension, of enmity, and of hate, that seemed seething in the minds of the extremists of both sections, were now concentrated in the prelude to a still greater and more tremendous conflict. It was during this administration that the leaders of the South appear to have definitely decided that the welfare of their section could not be satisfactorily conserved while the Southern States remained a part of the Federal Union. It must be remembered that ever since the foundation of the government, the statesmen of the South had consistently maintained that theory of the Federal Constitution which regarded the ultimate sovereignty as residing not in the nation as a whole, but rather in the individual states themselves which this theory—the theory of Calhoun and Hayne—held to be supreme and independent commonwealths. According to the view prevalent at the South, these sovereign states had entered into a league of union with the other states for purposes of mutual advantage; and this partnership, like others, was to endure only so long as its original purpose was maintained with regard to all the states. Events seemed now to indicate that the time for the dissolution of the compact had arrived. In the first place, the balance of political power was passing rapidly into the hands of a party inimical to the interests of the South, a party pledged to the ultimate abolition of slavery and to a commercial system of protection which was peculiarly unfavorable to an agricultural community such as the South then was. Regarding slavery, it is unfair to represent the South as, in the abstract, devoted to a servile system. The greatest statesmen of that section had always deplored the presence of the slaves as an economic and social injury; yet, inasmuch as slavery actually existed, the question was a practical one rather than a matter of speculative interest. Unmolested, and unsupported by the foreign slave-trade which the United States had taken a prominent part in abolishing, it is likely that the gradual extinction of slavery would have been brought about through natural causes. But at this time, the ill-judged zeal of Northern extremists had begun a crusade which, conducted with extreme bitterness and violence of denunciation, produced a most unfortunate effect. The sensitive and high-spirited people of the South heard with amazement the most indiscriminate abuse heaped upon them, because there existed among them an institution originally planted there largely through the instrumentality of the New England slave-dealers and Northern traders. They heard the purest and most kindly of their leaders attacked in language that would have been harsh if applied to branded criminals. It is not remarkable, therefore, that this ill-judged vituperation, led them to sink all their minor differences of opinion, and united them in defiant resistance to such wholesale onslaught. Men who believed thoroughly in the abstract wrongfulness of slavery, indignantly rushed to its defense, when the attack upon it took the form of an attack upon everything that the South revered. The Constitution itself distinctly recognized the existence of slavery, and the propaganda of the Abolition Party began to be accompanied by open denunciations of that instrument of government. It therefore appeared to the South that political peace with the people of the Northern States was likely to be best attained by separation; and this belief became crystallized into a definite purpose during the administration of James Buchanan. On the other hand, it must be confessed that the attitude of the Southern partisans was far from conciliatory. They had so long been accustomed to wield political power, and had met with so much subserviency from their associates at the North, whom Randolph had contemptuously nicknamed "Doughfaces," that they had acquired an arrogance of manner and of speech that justified a feeling of indignation. Their continual threats to destroy the Union, the violence to which so many of them were so ready to resort, as in the case of the assault upon Senator Sumner, and the high-handed proceedings that had marked the civil war in Kansas, all served to embitter and intensify the opposition at the North. It was very evident, therefore, that the political atmosphere was so charged with electricity as to render probable and perhaps even desirable, the storm that actually followed.

A few days after Mr. Buchanan's inauguration, the Supreme Court rendered its decision in the famous Dred Scott Case (q.v.) accompanied with the opinion of the majority of the justices, that Congress had no right to prohibit slavery in any territory and that slaves themselves were mere property whose secure possession in any state or territory was guaranteed by the Constitution.

Events now succeeded one another with exciting rapidity. The sympathizers with the South had made various attempts to extend the area of slavery by the acquisition of Cuba. In 1854 the American Ministers to England, France, and Spain met at the Belgian town of Ostend and there issued the so-called Ostend Manifesto to the effect that the safety of the United States demanded the annexation of Cuba. All hopes of

such an annexation, however, were frustrated by the united opposition of England, France, and Spain. Another attempt to acquire slave territory was in the direction of filibustering expeditions, the most famous of which were that of Lopez against Cuba in 1851, and that of William Walker (q.v.) from 1855 to 1858 against Central America. Both Lopez and Walker were taken prisoner and executed. Even the re-opening of the African slave-trade began to be discussed.

In December, 1857, a pro-slavery convention held at Lecompton, Kansas, submitted to the people a state constitution in such a way as to prevent its rejection, the only alternative offered being "for the constitution *with* slavery" and "for the constitution *without* slavery." The anti-slavery party generally abstained from voting, with the result that the constitution *with* slavery was adopted. A new territorial legislature with a Republican majority ordered a new election, at which the constitution was to be accepted or rejected. The national Congress passed a bill admitting Kansas under the Lecompton Constitution, but re-submitting that constitution to the vote of the Kansas people. They rejected it, and thus remained a territory. Two years later, a new convention adopted another constitution prohibiting slavery, and this being submitted to the people was adopted by them. Kansas, however, was not admitted as a state until 1861. Minnesota was admitted in May, 1858, and Oregon in February, 1859. In the last-named year a profound impression was made upon the country by the desperate deed of John Brown, a Connecticut man, who with a small party of followers seized the town of Harper's Ferry, Va., and the United States arsenal there, with the intention of exciting an insurrection among the slaves. He was surrounded and captured by Maryland and Virginia militia and executed December 2d, 1859.

In the presidential election of 1860 there were four tickets in the field. The Northern Democrats, who controlled the regular party convention, nominated Stephen A. Douglas, of Illinois and Herschel V. Johnson, of Georgia; the Southern Democrats, who had seceded from the convention, nominated John C. Breckinridge, of Kentucky and Joseph Lane, of Oregon; the remnants of the old Know-Nothing Party, now calling itself the Constitutional Union Party, nominated John Bell, of Tennessee and Edward Everett, of Massachusetts; while the Republicans nominated Abraham Lincoln, of Illinois and Hannibal Hamlin, of Maine. The Republican platform declared in favor of freedom in the territories, a protective tariff, internal improvements, and a Pacific railway. The result of the election was that Lincoln and Hamlin received 180 electoral votes; Breckinridge and Lane, 72; Bell and Everett, 39, and Douglas and Johnson, 12.

The election of Lincoln served as a signal for the consummation of the Southern plans for secession.

At the election of November, 1860, Mr. Lincoln had received every Northern vote in the electoral college, excepting the three of New Jersey, which were given to Mr. Douglas, 180 votes; while Mr. Breckinridge received the 72 electoral votes of the South. The North and South were arrayed against each other, and the South was beaten. Of the popular vote, Mr. Lincoln received 1,857,610; Mr. Douglas, 1,365,976; Mr. Breckinridge, 847,951; Mr. Bell, 590,631. Thus, while Mr. Lincoln gained an overwhelming majority of the electoral votes given by each state, the combined Democratic votes exceeded his by 356,317, and the whole popular vote against him exceeded his own by 946,948. A small majority, or even plurality, in the Northern states was sufficient to elect him.

Thus there was some ground for the taunt that Mr. Lincoln was a "minority President." But the true significance of the election was the fact which it revealed, that the sceptre of political power had finally departed from the South. The Slave States were at last confronted by an overwhelming opposition. The following figures from the census of each decade up to 1860 show the gradual growth of the power of the Free States:

| YEAR. | Free States. | Slave States. |
|------------|--------------|---------------|
| 1790 | 1,968,453 | 1,961,874 |
| 1800 | 2,684,616 | 2,621,316 |
| 1810 | 3,758,910 | 3,480,902 |
| 1820 | 5,152,372 | 4,485,810 |
| 1830 | 7,006,399 | 5,848,312 |
| 1840 | 9,733,922 | 7,334,433 |
| 1850 | 13,599,488 | 9,663,997 |
| 1860 | 19,128,418 | 12,315,872 |

The South lost no time in acting upon what her statesmen had declared would be the signal of their withdrawal from the Union. On November 10th, as soon as the result was known, the legislature of South Carolina ordered a state convention, which assembled December 17th, and on the 20th unanimously declared that "the Union now subsisting between South Carolina and other states, under the name of the United States, is hereby dissolved," giving as a reason that fourteen of these states had for years refused to fulfill their constitutional obligations. The example of South Carolina

was followed by Mississippi, January 8th, 1861; Florida, 10th; Alabama, 11th; Georgia, 19th; which were followed by Louisiana and Texas; and in 1861, by North Carolina, Virginia, Tennessee, and Arkansas. Kentucky and Missouri were divided, and had representatives in the governments and armies of both sections.

On February 4th, 1861, delegates from the seven then seceded states met at Montgomery, Ala., and formed a provisional government, under the title of the Confederate States of America. A constitution was adopted similar to that of the United States, and the government fully organized, February 18th, 1861; President, Jefferson Davis, of Mississippi; Vice-President, Alexander H. Stephens, of Georgia; and on May 24th, established at Richmond, Virginia. The secession movement appears to have been nearly unanimous in the more Southern states, and to have been carried in all by decided majorities. As state after state withdrew from the Union, its senators and representatives in Congress at Washington resigned their seats; and nearly all the officers of the army and navy, of Southern birth, believing that their first and final allegiance was due to their states, and that the action of each state carried with it all its citizens, also resigned their commissions, and tendered their swords to their respective states, and to the Confederacy which these had formed.

President Buchanan, doubting his constitutional power to compel the seceding states to return to the Union, made a feeble and ineffectual attempt to relieve the garrison of Fort Sumter, in Charleston harbor, closely besieged by the forces of South Carolina. Commissioners were sent to Washington to negotiate for the settlement of the claims of the Federal government, and great efforts were made to effect compromises of the difficulties, but without result.

Meanwhile, to the vacillation and incompetence of the President, the prompt and vigorous action of the Southern leaders formed a striking contrast. By their direction, armed forces were rapidly organized, United States arsenals and arms were seized, and batteries were planted for the reduction of such forts as threatened a firm resistance.

At about this time the territories of Nevada, Colorado, and Dakota were organized by Congress.

XIX. and XX. ADMINISTRATION OF ABRAHAM LINCOLN (1861-1865) and of ANDREW JOHNSON (1865-1869). *Cabinet*.—*Secretary of State*, William H. Seward, New York, March 5th, 1861. *Secretary of Treasury*, S. P. Chase, Ohio, March 5th, 1861; W. P. Fessenden, Maine, July 1st, 1864; Hugh McCulloch, Indiana, March 7th, 1865. *Secretary of War*, Simon Cameron, Pennsylvania, March 5th, 1861; Edwin M. Stanton, Pennsylvania, January 15th, 1862; U. S. Grant (*ad interim*), August 12th, 1867; Edwin M. Stanton (reinstated), January 14th, 1868; J. M. Schofield, Illinois, May 28th, 1868. *Secretary of Navy*, Gideon Welles, Connecticut, March 5th, 1861. *Secretary of Interior*, Caleb P. Smith, March 5th, 1861; John P. Usher, Indiana, January 8th, 1863; James Harlan, Iowa, May 15th, 1865; O. H. Browning, Illinois, July 27th, 1866. *Attorney-General*, Edward Bates, Missouri, March 5th, 1861; Titian J. Coffey, June 22d, 1863; James Speed, Kentucky, December 2d, 1864; Henry Stanbery, Ohio, July 23d, 1866; William M. Evarts, New York, July 15th, 1868; *Postmaster-General*, Montgomery Blair, Maryland, March 5th, 1861; William Dennison, Ohio, September 24th, 1864; Alexander W. Randall, Wisconsin, July 25th, 1866.

On the 4th of March, 1861, President Lincoln was inaugurated at Washington. In his inaugural address, he said: "I have no purpose, directly or indirectly, to interfere with the institution of slavery in the states where it exists. I believe that I have no lawful right to do so, and I have no inclination to do so." On the 7th of April, a naval expedition set sail from New York for the relief of Fort Sumter; and its arrival off Charleston harbor was the signal for the commencement of a bombardment of the fort by the confederate batteries of Gen. Beauregard. The surrender of the fort, April 13th, was followed by a sudden outburst of excited feeling in the North. The government called out 75,000 volunteers, large numbers of whom were in a few days marching to the defense of Washington. On April 18th, the Confederates seized the arsenal at Harper's Ferry, and took or destroyed a large quantity of arms and machinery. On the 20th, the navy-yard, near Norfolk, Va., was destroyed by the United States officers, and five large men-of-war burned or sunk, to prevent their falling into the hands of the Confederates. Opposed to the Union volunteers assembled at Washington, the Confederates took up a position at Bull Run, a few miles distant from the Potomac, under Gen. Beauregard, where they were attacked by Gen. McDowell. A severe action resulted in the repulse and complete panic of the Union forces, who hastily retreated to Washington. Congress saw that it must act in earnest, and that the war was not to be ended in 90 days by 75,000 volunteers. It voted to call out 500,000 men.

The Confederate States had a population of 5,582,122 free inhabitants, and 3,519,903 slaves; total, 9,102,024; and though the negroes were not called into the field except as laborers, they were not less useful in supplying the armies by carrying on the agricultural labor of the country. The Confederates had also the strong sympathy and aid of the four slaveholding border states, prevented by their position from seceding,—Delaware, Maryland, Kentucky, and Missouri. Holding their position in Virginia, the Confederates erected fortifications on the Tennessee and Cumberland Rivers and on important points of the Mississippi, from Columbus, in Kentucky, to its mouth. They also made a strong effort to secure the state of Missouri, as well as to defend the

sea-ports through which they must receive their most important supplies from abroad. The United States government, on its side, blockaded the whole line of coast from Virginia to Texas, and sent large forces to secure the doubtful states. Gun-boats were rapidly built for the rivers of the west, and vessels purchased and constructed for the navy. In December, 1861, the North had 640,000 men in the field, and the Confederates had 210,000, and had called for 400,000 volunteers.

The first important operation of 1862 was the taking of the defenses of the Cumberland and Tennessee Rivers (Feb. 6), which led to the occupation of Nashville, the capital of Tennessee, henceforth held by the United States troops—Andrew Johnson, formerly governor and senator, having been appointed military governor. Roanoke Island was also captured, on the coast of North Carolina. In March, Gen. McClellan, who had succeeded the aged Lieut.-Gen. Scott as commander-in-chief, commenced a movement on Richmond, the seat of the Confederate government, now defended by Gen. Lee. On the 8th of Mar., the Confederate iron-clad *Virginia*, constructed from the United States steamer *Merrimac*, which had been sunk at Norfolk and raised by the Confederates, attacked the federal fleet in Hampton Roads, and in forty minutes sunk the *Cumberland*, and set on fire and captured the *Congress* (frigates); while the other vessels took refuge in shoal water or in flight. The next day, the *Monitor*, a war vessel, of entirely novel construction, low and flat, with a revolving turret, invented by Capt. Ericsson, engaged the *Virginia*. The battle lasted two hours without result. On the 6th of April, a sanguinary but indecisive battle was fought near Corinth, Ala., the Federals being protected by gun-boats. Soon after, Admiral Farragut, with a fleet of 45 vessels, carried the forts at the mouth of the Mississippi River, and took New Orleans; while the armies and gun-boats captured the fortifications on the upper part of the river as low as Memphis, Tenn. In the mean time, Gen. McClellan had besieged and taken Yorktown, and fought his way up the peninsula of the James River, until within five m. of Richmond, when he was beaten in a series of sanguinary battles, and driven, with a loss, in six days, of 15,000 men, to the shelter of his gun-boats; while Gens. Banks and Pope, sent to co-operate with him in the Shenandoah valley, were defeated and driven back by Gen. "Stonewall" Jackson. On the 1st of July, the President called for 300,000, and on Aug. 4th, 300,000 more men for the Union army. Congress abolished slavery in the District of Columbia, prohibited it in the territories, and passed a resolution to compensate the masters in any state that would abolish slavery. They also authorized the President to employ negroes in the army, and to confiscate the slaves of insurgents. In August, the Northern forces were a second time defeated at Bull Run, and Gen. Lee crossed the Potomac into Maryland, creating great alarm in Washington, and even in Philadelphia. Gen. McClellan made a rapid march, and met him at Sharpsburg or Antietam. A drawn battle resulted in the retreat of Gen. Lee, covering an immense train of provisions, horses, cattle, etc., which was probably the object of his expedition. A Confederate invasion of Kentucky, about the same time, was attended with similar results. Another advance on Richmond was led by Gen. Burnside, who had superseded Gen. McClellan; but he was confronted by Gen. Lee at Fredericksburg, and defeated in one of the most sanguinary battles of the war. President Lincoln issued a proclamation declaring the freedom of all the slaves in insurgent states—a measure which was not justified by the Constitution, but which was professedly a "war measure," and to be defended on the plea of military necessity. In like manner, the suspension of the writ of habeas corpus (q.v.), the frequent seizure of newspapers, the dispersion of public meetings, and the imprisonment without trial, of opponents of the government at the North, were generally allowed to be essential to the security of the nation.

While the Army of the Potomac was vainly endeavoring to advance on Richmond, the army of Tennessee, under Gen. Rosecrans, with its base at Nashville, was trying to sever the Atlantic from the gulf states, and cut off the railways that supplied the confederate armies in Virginia. At Murfreesborough, Tenn., the Confederate Gen. Bragg attacked Gen. Rosecrans with the usual result of heavy losses on both sides, but no decided victory.

Early in May, 1863, Gen. Hooker, who had succeeded Gen. Burnside in the command of the Army of the Potomac, crossed the Rappahannock, and was defeated by Gen. Lee at Chancellorsville with great slaughter; but this victory was dearly bought by the loss of Gen. Jackson, mortally wounded in mistake by his own soldiers. Gen. Lee now took the offensive, and invaded Pennsylvania, advancing as far as Harrisburg; but being met by Gen. Meade, the new commander of the army of the Potomac, he attacked him in a strong position at Gettysburg without success, and was compelled to recross the Potomac. In the mean time, the two principal fortresses of the Mississippi—Vicksburg and Port Hudson—attacked by land and water, after a long siege, were starved into capitulation, and the entire river was open to the Union gun-boats. Charleston, blockaded since the beginning of the war, was now strongly besieged—its outworks, Forts Gregg and Wagner, taken, Fort Sumter battered in pieces, but still held as an earthwork, and shells thrown a distance of five miles into the inhabited part of the city. In September, Gen. Rosecrans had taken the strong position of Chattanooga, and penetrated into the n.w. corner of Georgia, where he was disastrously defeated by Gen. Bragg at the battle of Chickamauga. At this period, there were great peace-meetings in the North, terrible riots in New York against the conscription and the negroes; while the banks having sus-

pending specie payments, the paper-money of both Unionists and Confederates was largely depreciated. The sums of money appropriated by Congress for the expenses of this year amounted to \$972,000,0-0. The Confederates were, however, cut off from all foreign aid, except what came to them through the blockade, and their own resources, both of men and material, were becoming exhausted. The railways were worn, many destroyed or occupied by the Union troops, and it became difficult to transport supplies and feed armies. The North had command of the sea, and access to foreign markets.

At the commencement of 1864, the Northern forces held, including the garrisons on the Mississippi, nearly 100,000 prisoners of war. The Southerners also had about 40,000 Union prisoners, whom they could feed with difficulty, and who suffered great hardships. Gen. Ulysses S. Grant, who had been successful at Vicksburg, was appointed commander-in-chief of the Union armies, and commenced a vigorous campaign over an immense area—in Virginia, the Carolinas, Georgia, Louisiana, and Arkansas, with the determination “to hammer continuously against the armed forces of the enemy and his resources, until by mere attrition he should be forced to submit.” Of the Confederates, Gen. Lee defended Petersburg and Richmond; Gen. J. E. Johnston opposed the Army of Tennessee at Dalton, Georgia; Gen. Forrest was in Mississippi; Gen. Taylor and Kirby Smith commanded in Louisiana and Arkansas. In February, Gen. Sherman marched from Vicksburg, making a destructive raid across northern Mississippi to Alabama. In March, the United States had 1,000,000 of men raised and provided for. The entire Confederate forces probably numbered 250,000. The Army of the Potomac, commanded by Gen. Meade, under the personal superintendence of Gen. Grant, covered Washington, and advanced toward Richmond; Gen. Butler advanced from Fortress Monroe up the James river; Gen. Sigel marched up the Shenandoah. Sherman united the Armies of Tennessee, Cumberland, and Ohio, at Chattanooga, where he had nearly 100,000 men and 250 guns. Gen. Banks had 61,000 men in Louisiana. In March, Gen. Banks moved up the Red River, toward Shreveport, but was defeated on the 24th, and driven back to New Orleans. In May, the campaign of Virginia commenced, and the Army of the Potomac fought a series of battles at the Wilderness, Spotsylvania Court-house, Jericho’s Ford, North Anna, and Cold Harbor, with terrible losses. After each repulse the Union troops took up a new position further south, with a new base, until they had made half the circuit of the Confederate capital. Gen. Breckinridge defeated Sigel in the Shenandoah valley, and once more threatened Washington. Gen. Sheridan, with a strong cavalry force, drove back the Confederates and laid waste the valley. In September, Gen. Sherman, advancing with a superior force, captured Atlanta. Gen. Hood, superseding Johnston in the command of the Confederates, was outgeneraled and beaten. While he marched west to cut off Gen. Sherman’s base, and attack Nashville, where he was defeated, Sherman burned Atlanta, destroyed the railway, and marched boldly through Georgia to Savannah. The Confederates made strong efforts, and won victories, but with no permanent result.

In 1865, the United States government made a new draft for 500,000 men. Expeditions were organized against Mobile. Wilmington, the most important Confederate port, was taken by a naval and military expedition. Savannah and Charleston, approached in the rear by Sherman, were evacuated. Cavalry raids cut off the railways and canal that supplied the Confederate army in Petersburg and Richmond. Finally, on March 29th, 1865, a series of assaults was made upon the Confederate works, during ten days of almost continual fighting, until the Confederates were worn down with fatigue. Richmond and Petersburg were evacuated on April 2d; and on the 9th, after several conflicts, Gen. Lee surrendered at Appomattox Court-house, his army numbering 28,000. At this period, it is said that there was not lead enough remaining in the Confederate States to fight a single battle. On the 12th, Mobile surrendered with 3000 prisoners and 300 guns. Then Gen. Johnston, in North Carolina, surrendered a few days after to Gen. Sherman; and the trans-Mississippi Confederate army followed his example. The last battle took place at Boco Chico, Texas, May 10, in which a Union force under Gen. Barrett lost 75 men.

The war was scarcely ended when 800,000 men were paid off. During the war, the number of men called for by the Federal government was 2,759,049; the number actually furnished was 2,653,062. Of colored troops there were 186,097. The state of New York, with a population of less than 4,000,000, sent 223,836 volunteers. There was an annual waste of one-third, half of which was by wounds in battle. The Union losses during the war were estimated at 316,000. The statistics of the Confederate forces are imperfect; but in 1864, the army consisted of 20,000 artillery, 128,000 cavalry, 400,951 infantry; total, 549,226 men. The Confederate losses are unknown.

In 1864 Mr. Lincoln had been re-elected President, and Andrew Johnson, of Tennessee, Vice-President. The Democratic party had nominated Gen. George B. McClellan, of New Jersey and George H. Pendleton, of Ohio, on a platform which declared the conduct of the war to be a failure. Mr. Lincoln received 212 electoral votes, and McClellan 21. Only New Jersey, Delaware, and Kentucky were carried by the Democrats. West Virginia had been admitted to the Union, December 31st, 1862.

On April 14th, while the North was rejoicing over the capture of Richmond and the surrender of the Confederate armies, the President was assassinated at a theatre in Washington, by John Wilkes Booth, an actor; while an accomplice attacked and nearly

killed Mr. Seward, Secretary of State. The assassin was pursued and killed, and several of his accomplices tried and executed. Andrew Johnson became president. Jefferson Davis and other Confederate officials were mistakenly supposed to be privy to the assassination of President Lincoln, which was, in fact, regarded at the South with horror and regret, and large rewards were offered for their apprehension. Mr. Davis was captured in Georgia, and placed in Fortress Monroe, but released without trial in May, 1867. An amendment to the Constitution, forever abolishing slavery in the states and territories of the Union, was declared ratified by two-thirds of the states, December 18th, 1865.

The termination of the war imposed upon Congress the important duty of reconstructing the governments of the states that had seceded, which became the most important question before the national government. Here a difference grew up between President Johnson and Congress, the President having proclaimed a policy in the settlement of the southern question, which was obnoxious to the Republican leaders in both houses of Congress. The President recognized loyal governments as existing in the states of Virginia, Tennessee, Arkansas, and Louisiana, and appointed provisional governors for the other lately seceded states, with the power to call conventions for the purpose of establishing permanent governments. His policy was to recognize governments so organized, and to restore the states in question to their rights under the Constitution, whenever they should have repealed their several ordinances of secession, repudiated the Confederate debt, and ratified the thirteenth amendment to the Constitution, adopted in 1865, forever putting an end to slavery in the United States. This plan was unsatisfactory to Congress, which passed, in 1867, three acts, known as "the reconstruction acts," under which the southern states were divided into military districts, and placed under the military authority of the United States; while it became necessary for the states recently seceded, in order to regain their status among the other states, to ratify both the thirteenth and fourteenth amendments to the Constitution, the latter of which (adopted in 1868) gave the right of suffrage to the negro, denied to those persons previously in rebellion against the United States the right to hold office under the national or state governments, and repudiated the Confederate debt. The bitter struggle between the President and Congress continued during the remainder of his administration, and culminated in the resolution of the House of Representatives, passed Feb. 24, 1868, to impeach the President "of high crimes and misdemeanors." The immediate occasion of the passage of this resolution was the course of President Johnson in violating the "tenure-of-office act," as it was termed, which made requisite the consent of the Senate to removals from office by the President, and which was particularly intended to interfere with and prevent his removal of Mr. Stanton from the position of Secretary of War. The Senate formed itself into a high court of impeachment; and on Mar. 23d, 1868, the Chief-Justice presiding, proceeded to try Andrew Johnson on eleven articles of impeachment. The result was his acquittal, the prosecution lacking the necessary two-thirds majority, inasmuch as five Republicans voted with the Democrats against conviction. This led to the retirement of Mr. Stanton from the office of Secretary of War. It was not until 1868 that the states of Arkansas, Alabama, Florida, North and South Carolina, Georgia, and Louisiana were readmitted into the union. On March 1st, 1867, Nebraska had been admitted as a new state.

At the election of 1868, the Republican candidates were Ulysses S. Grant, of Illinois and Schuyler Colfax, of Indiana. The Democrats nominated Horatio Seymour, of New York and Francis P. Blair, of Missouri. Grant and Colfax received 240 electoral votes, and Seymour and Blair 80—the Democrats having carried nine states. On February 26th, the fifteenth amendment to the Constitution, guaranteeing the right of suffrage without regard to race, color, or previous condition of servitude, passed Congress, and was ratified March 30th, 1870.

XXI. and XXII. ADMINISTRATION OF ULYSSES S. GRANT (1869-1877). Cabinet.—*Secretary of State*, E. B. Washburne, Illinois, March 5th, 1869; Hamilton Fish, New York, March 11th, 1869. *Secretary of Treasury*, George S. Boutwell, Massachusetts, March 11th, 1869; William A. Richardson, Massachusetts, March 17th, 1873; Benjamin H. Bristow, Kentucky, June 2d, 1874; Lot M. Morrill, Maine, June 21st, 1876. *Secretary of War*, John A. Rawlins, Illinois, March 11th, 1869; William T. Sherman, Ohio, September 9th, 1869; William W. Belknap, Iowa, October 25th, 1869; Alphonso Taft, Ohio, March 8th, 1876; J. D. Cameron, Pennsylvania, May 22d, 1876. *Secretary of Navy*, Adolph E. Borie, Pennsylvania, March 5th, 1869; George M. Robeson, New Jersey, June 25th, 1869. *Secretary of Interior*, Jacob D. Cox, Ohio, March 5th, 1869; Columbus Delano, Ohio, November 1st, 1870; Zachariah Chandler, Michigan, October 19th, 1875. *Attorney-General*, E. R. Hoar, Massachusetts, March 5th, 1869; Amos T. Akerman, Georgia, June 23d, 1870; George H. Williams, Oregon, December 14th, 1871; Edwards Pierrepont, New York, April 26th, 1875; Alphonso Taft, Ohio, May 22d, 1876. *Postmaster-General*, J. A. J. Creswell, Maryland, March 5th, 1869; Marshall Jewell, Connecticut, August 24th, 1874; James M. Tyner, Indiana, July 12th, 1876.

One of the most important events of Pres. Grant's administration was the meeting of the Joint High Commission, appointed to consider the *Alabama* case, and which concluded the Treaty of Washington, so called, ratified by the Senate, May 24th, 1871.

The commission met in Washington, and the treaty provided that a tribunal of arbitration should be constituted, to consist of one member from Great Britain, one from the United States, and one each from Switzerland, Italy, and Brazil. The function of this tribunal was to decide on the *Alabama* claims, being the claims of the United States against the British government for damages on account of the injury done to American commerce by the *Alabama* and other Confederate cruisers, fitted out in British ports. The *Alabama* commission met at Geneva, in Switzerland, Dec. 15th, 1871, and after a presentation of the cases of the two governments adjourned to meet again June 15th, 1872. At the latter date, accordingly, the sessions were renewed, and at the thirty-second of these, Sept. 14th, the decision was announced, that "the tribunal, by a majority of four voices to one, awards to the United States a sum of \$15,500,000 in gold, as the indemnity to be paid by Great Britain to the United States for the satisfaction of all the claims referred to the consideration of the tribunal." The only dissenting voice was that of the representative of Great Britain.

Among other notable occurrences during this administration was the completion of the Union and Central Pacific railroads, 1869, providing a continuous line of railway from the Missouri to the Pacific, and completing the trans-continental system. Out of the connection of the government with the construction of these roads, arose the Credit Mobilier scandal, which involved the reputation of many prominent members of Congress. (See CREDIT MOBILIER OF AMERICA.) The enmity of the white population of the Southern States to the freedmen, particularly in regard to the exercise by the latter of their newly-acquired right of suffrage, attracted public attention, 1868-72, until the investigation by Congress, and consequent legislation, had made such outrages difficult. (See KU KLUX KLAN.) A movement by the government in the direction of the acquisition of Saint Domingo, at the desire of President Grant, deserves mention. The people of that country were willing to be annexed to the United States, but the American Senate rejected the proposal. In March, 1871, the first steps were taken toward the reform of the Civil Service by a bill authorizing the President to appoint a board of Civil Service Commissioners to provide for the appointment of applicants for minor offices on the basis of an examination.

During Gen. Grant's first administration a new party arose as the result of a reaction against the extreme centralization of power in the federal government that had resulted from the exigencies of war. This party was known as the Liberal Republican Party, and numbered among its adherents some of the most prominent names in the old Republican Party—Horace Greeley, Charles Francis Adams, Charles Sumner, Carl Schurz, and Chauncey M. Depew. This party nominated, in 1872, Horace Greeley of New York, for President, and B. Gratz Brown of Missouri, for Vice-President, on a platform deprecating any further interference by the government in the local affairs of the South. This ticket was ratified by the Convention of the Democratic Party held in the same year. The Republicans re-nominated Gen. Grant, with Henry Wilson, of Massachusetts, for Vice-President. The Republican ticket received 286 electoral votes, against 63 scattering, Mr. Greeley having died before the Electoral College met. The votes of Louisiana and Arkansas and three votes from Georgia were not counted.

A serious difficulty with Spain was near occurring in 1872, through the outrageous act of the Spanish steamer *Tornado*, in capturing, on October 31st, 1872, the *Virginian*, a vessel sailing on the high seas, under the American flag. The *Virginian* was engaged in transporting men and arms for the insurgents in Cuba, and had 170 men on board, including the crew; these were all taken prisoners, and 58 of them, including Capt. Fry, commanding the *Virginian*, and Gen. Ryan, an American, were summarily shot. The affair created great excitement throughout the United States, and was only peaceably settled after much negotiation, and while actual preparations for war were being made on both sides. Spain was forced to apologize, to salute the American flag, to give up the *Virginian*, and to pay an indemnity to the families of the murdered men. The remainder of Gen. Grant's administration was marked by no special event, excepting the celebration of the centennial of American independence, May-Nov., 1876, in Philadelphia, by an international exposition of arts, manufactures, and products. (See CENTENNIAL EXHIBITION.)

In 1873-74, the party known as "Grangers," or "Patrons of Husbandry" (see GRANGE), rose into some prominence; an act for the resumption of specie payment, in 1879, was passed in 1874; an extensive "Whisky Ring" was exposed in 1875, involving a corrupt association among distillers and federal officers to defraud the government of the tax on liquors; and much local disorder occurred in the Southern states between the so-called "carpet-bag" governments and the white citizens. Colorado was admitted as a state, August 1st, 1876.

In 1876, the Republican candidates were Rutherford B. Hayes, of Ohio and William A. Wheeler, of New York; the Democratic candidates were Samuel J. Tilden, of New York and Thomas A. Hendricks, of Indiana. On the face of the returns, Tilden and Hendricks had 184 electoral votes, to 172 for Hayes and Wheeler, with the votes of Florida, Louisiana, and Oregon in doubt. The scenes and incidents that followed this election have passed into history as among the most exciting in the annals of our country. An election so close as to hang upon a single electoral vote; charges of fraudulent voting in several states to a sufficient extent to render questionable not one

alone, but several votes in the Electoral College ; party feeling running so high as to threaten at each moment the performance of some overt act on one side or the other which might deluge the country with blood, and set back civilization for many years ; such were the elements which rendered this struggle one of the most momentous since the foundation of the government. Messrs. Hayes and Wheeler were finally declared elected by an Electoral Commission chosen from both houses of Congress and from the Supreme Court of the United States ; and whose decision was accepted by all concerned as final and irrevocable. (See ELECTORAL COMMISSION.) As finally counted, 185 electoral votes were given to Hayes and Wheeler, and 184 votes to Tilden and Hendricks.

XXIII.—ADMINISTRATION OF RUTHERFORD B. HAYES (1877-1881). *Cabinet*.—*Secretary of State*, William M. Evarts, New York, March 12th, 1877. *Secretary of Treasury*, John Sherman, Ohio, March 8th, 1877. *Secretary of War*, George W. McCrary, Iowa, March 12th, 1877 ; Alexander Ramsey, Minnesota, December 12th, 1879. *Secretary of Navy*, Richard W. Thompson, Indiana, March 12th, 1877 ; Nathan Goff, Jr., West Virginia, January 6th, 1881. *Secretary of Interior*, Carl Schurz, Missouri, March 12th, 1877. *Attorney-General*, Charles Devens, Massachusetts, March 12th, 1877. *Postmaster-General*, David M. Key, Tennessee, March 12th, 1877 ; Horace Maynard, Tennessee, August 25th, 1880.

The year 1877 was made memorable by the troubles in South Carolina and Louisiana, where rival state governments, each claiming to be legally elected, struggled for supremacy. In the former state the difficulty was settled by President Hayes, who ordered the withdrawal of the United States troops which had been stationed at Columbia, S. C., and had been an objectionable feature of the contest ; whereupon the Republican governor, Chamberlain, retired, and Gen. Wade Hampton took peaceful possession of the office. A settlement was also effected in Louisiana, a commission being sent thither by the President, when the Democratic governor, Nichols, was enabled to gain possession of his seat, the Federal troops being in this instance also withdrawn from New Orleans.

This action marked the end of federal interference in the local concerns of the Southern States—an interference that had become yearly more objectionable to moderate men at the North, who no longer cherished the animosities resulting from the civil war.

This year was further noteworthy by the occurrence, in July, of the railroad strikes and riots which prevailed throughout the country, to the injury of business, and with serious loss of property. (See STRIKES.) The question of the title of President Hayes to his seat attracted some attention during 1878, and resolutions and a memorial were laid before the legislature of the state of Maryland asking for legislative investigation on the part of Congress as to its legality. A committee of investigation as to the frauds alleged to have been committed in Florida, Louisiana, South Carolina, and Oregon, in connection with the election of the President, was afterwards appointed by Congress, and did so investigate ; but neither of these movements served to disturb Mr. Hayes's title. The excitement occasioned by the near approach of the period fixed by Congress for the resumption of specie payments produced a demand on the part of numbers of persons throughout the country for a party opposed to the prevailing sentiment with regard to financial questions. Such a party was, in fact, organized at Toledo, Ohio, Feb. 22d, 1878, under the name of the National Party, delegates being present from 28 states ; and its platform of principles duly enunciated. These included bi-metallism, the government to exercise exclusively the function of creating money and regulating its value ; suppression of national bank issues ; money to be provided by the government in accordance with the necessities of labor and trade ; bonds to be taxed ; a graduated income-tax to be levied ; reduction of the hours of labor, bureaus of labor and industrial statistics to be established ; opposition to the contract-system in prisons, and to Chinese labor. In the state elections of the same year, this party, which became popularly known as the "Greenback Party," polled upward of a million votes.

During the year 1878 an important event in foreign relations was the establishment of a permanent Chinese legation at Washington. This embassy was the result of the treaty with China, ratified at Washington on July 16th, 1878, and which had been negotiated by Mr. Burlingame, American minister at Peking. Special articles of this treaty were those permitting entire religious liberty in the two countries ; reprobating any but voluntary emigration from one to the other ; conferring mutual privileges, immunities, and exemptions, in respect to travel and residence, on citizens of the two treaty-making powers, and insuring all the advantages of the government educational institutions of the two countries to the citizens of either ; including also permission for the citizens of either country to establish and maintain schools, respectively, in each country, in accordance with the laws of each for such cases made and provided. The general course of the administration of President Hayes was uneventful. The country was in a fairly prosperous condition, chiefly owing to the continuance of abundant crops, and the year 1878 closed without any significant occurrence whatsoever to mar the equable flow of affairs, domestic and foreign. On Jan. 1st, 1879, specie payments were resumed throughout the United States, after a suspension of 17 years, and in accordance with the act of Congress approved Jan. 14th, 1875. The process of resumption was effected without excitement, there being but little demand for gold, and the New York Gold Room closed operations.

An extraordinary movement northward of the colored population of certain of the Southern States took place in 1879, and was the source of much uneasiness among the planters, and the subject of general discussion throughout the country. (See *NEGRO EXODUS*.) This year, also, saw the decline and fall of the labor agitation in San Francisco, which, under the leadership of Denis Kearney, had been continued with great virulence since 1877. So powerful did this movement become, that it was able to dictate a new constitution for the state of California, an act which resulted in driving capital from the state, and in bringing about a condition of business depression and general stagnation never before paralleled on the Pacific Coast. The conclusion of this agitation was the deposition of Kearney from leadership. The year 1880 opened with serious political trouble in Maine, where two legislatures (Fusion and Republican) declared themselves to be legally in session; two governors of the state were declared elected, and were inaugurated, and a serious situation ensued, threatening bloodshed and revolution for many weeks, concluded by the supreme court of the state declaring in favor of the Republican governor, Daniel F. Davis, who took possession of the office on Jan. 17th.

This being the year of the presidential election, conventions were held in every state by the different political parties; and on June 2d, the Republican national convention met in Chicago to nominate candidates for President and Vice-President. The names most prominent before this convention were those of Ulysses S. Grant, James G. Blaine, and John Sherman, for President. The excitement within the convention and throughout the country was intense. The opposition to Gen. Grant's re-election for a third term was extended throughout the Republican party, though several states at their conventions had chosen delegations favoring Grant to the national convention, and directed them to vote as a unit, notably, New York and Pennsylvania. The vote for Gen. Grant in the convention finally settled at 306, and it became obvious that it was impossible to effect any union of the conflicting delegations on either Blaine or Sherman with sufficient strength to insure a nomination. Through the efforts of William H. Robertson, a delegate from New York, the unit rule was broken by that delegation, and a compromise was effected on James A. Garfield, of Ohio, with Chester A. Arthur, of New York, for Vice-President. On June 11th, the Greenback national convention met in Chicago and nominated James B. Weaver for President, who was afterwards accepted as the candidate of the Socialist party. On June 23d the Democratic national convention assembled at Cincinnati, Ohio, and nominated Winfield S. Hancock, of Pennsylvania and William H. English, of Indiana. The result of the election was the choice of Messrs. Garfield and Arthur, who received 214 electoral votes as against 155 votes cast for Hancock and English.

XXIV.—ADMINISTRATION OF JAMES A. GARFIELD (1881) AND OF CHESTER A. ARTHUR (1881-1885). *Cabinet*.—*Secretary of State*, James G. Blaine, Maine, March 5th, 1881; Frederick T. Frelinghuysen, New Jersey, December 12th, 1881. *Secretary of Treasury*, William H. Windom, Minnesota, March 5th, 1881; Charles J. Folger, New York, October 27th, 1881. *Secretary of War*, Robert T. Lincoln, Illinois, March 5th, 1881. *Secretary of Navy*, W. H. Hunt, Louisiana, March 5th, 1881; Wm. E. Chandler, New Hampshire, April 12th, 1882. *Secretary of Interior*, S. J. Kirkwood, Iowa, March 5th, 1881; Henry M. Teller, Colo., April 6th, 1882. *Attorney-General*, Wayne MacVeagh, Pennsylvania, March 5th, 1881; Benjamin H. Brewster, Pennsylvania, December 16th, 1881. *Postmaster-General*, Thomas L. James, New York, March 5th, 1881; Timothy O. Howe, Wisconsin, December 20th, 1881; W. Q. Gresham, Indiana, April 3d, 1883; Frank Hatton, Iowa, October 14th, 1884.

Those members of the Republican party who had favored the election of Gen. Grant, for a third term of the presidency, and who were popularly known as "Stalwarts" had not been pleased with the nomination of Mr. Garfield. In the presidential campaign, they had with difficulty been induced to give his candidacy their support, and when they finally did so, it was with a general understanding that the candidate, if successful, should favor them with a liberal share of patronage. The new President had in various ways shown his desire to conciliate both wings of the party. Before the inauguration he had held many conferences with the leaders of each, and it was understood that his aim was to reach some satisfactory agreement in regard to the disposal of the presidential patronage. His first nominations were apparently dictated by a desire to conciliate the "Stalwarts." But his appointment of William H. Robertson (who had been largely instrumental in securing the President's nomination at Chicago) to the post of collector of the port of New York, aroused the opposition of the senator from that state, Mr. Roscoe Conkling, a leading "Stalwart." Finding that his opposition was ineffectual, Mr. Conkling and his colleague, Mr. Platt, resigned their seats in the Senate, May 16th, and appealed to the New York legislature for re-election as a justification of their course. The appeal was unsuccessful, and a bitter contest, lasting until the latter part of July, ended with the election of Messrs. Miller and Lapham to the Senate. Meanwhile the President's appointments had been confirmed. The new Postmaster-General had discovered colossal frauds in the Star Route Service of the postal department, and the president had directed him and the Attorney-General to bring the criminals to justice. The diplomacy of Mr. Blaine in regard to the war between Chili and Peru and the Panama Canal (see INTEROCEANIC SHIP CANAL) excited considerable newspaper criticism.

On July 2d, the country was astounded by the intelligence that President Garfield had been shot by an assassin as he was entering a railway station in Washington. The fight between the two rival factions of the Republican party had engendered so much bitterness that the first news awakened vague but terrible suspicions. It was a relief, therefore, to find that the assassin, who was immediately arrested, was acting entirely on his own responsibility. He proved to be an insignificant creature, named Charles J. Guiteau, who was consumed by a morbid passion for notoriety, and whose vanity had been offended by the refusal of an office. The President was taken to the White House. He lingered for seventy-nine days between life and death, receiving the sympathy of the civilized world, and died, Sept. 19th, at Elberon, N. J., whither he had been taken thirteen days before, as his last chance for life. On the same day Vice-President Arthur took the oath of office as President in New York, and subsequently repeated it before Chief Justice Waite in Washington.

The trial of the assassin Guiteau was begun on Nov. 14th, 1881. The only defense set up was insanity; but, after a protracted trial, in which the prisoner shocked the country by his exhibitions of callousness, malevolence, and vulgar buffoonery, a verdict of guilty was rendered on Jan. 25th, 1882. He was hanged June 30th, in the jail at Washington. The most important features of national legislation in 1882, were the Anti-Polygamy Bill, March 23d, the Apportionment Bill, increasing the number of congressional representatives to 325, and the Anti-Chinese Bill, suspending Chinese immigration for twenty years. The latter was vetoed by the President, who, however, signed a subsequent bill limiting the term of suspension to ten years. Among the several state elections of this year, one, at least, had a national significance. In New York the lukewarmness of that wing of the Republican Party which had sympathized with Gen. Garfield in his contest with the leaders of the faction to which Mr. Arthur was allied, and the indignation of the "Independents" at the political methods pursued by the President to secure the nomination and election of his friend, Charles J. Folger, as Governor of the state, resulted in the election of the Democratic candidate, Grover Cleveland, by an immense majority of 192,000 votes. The victory of the Democrats in Pennsylvania, was also looked upon as to some extent a rebuke of the administration, and especially of machine methods in politics. The question of civil-service reform (q.v.) was now pressed with renewed eagerness by its advocates. The public mind seemed to be in a fit temper to receive it, as it was recognized that the sacrifice of President Garfield's life was an indirect result of a petty squabble over the distribution of party spoils. The Civil-Service Bill, which had already passed the Senate, passed the house, 1883, Jan. 4, and was signed by the President. In the same year the Star Route trials ended with the acquittal of the defendants. This was generally looked upon as a gross miscarriage of justice, though the technical difficulties in the case were recognized by eminent lawyers. The most important event of the year 1884 was the presidential election. The Republican national convention met in Chicago during the first week of June, and the fourth ballot resulted in the nomination of James G. Blaine (q.v.) for the presidency. John A. Logan, of Illinois, was nominated for Vice-President. The nomination of Mr. Blaine was secured in the teeth of the bitter and organized opposition of the "Independent" faction in the Republican party, popularly known as "Mugwumps." The papers which represented the views of the "Independents" at once withdrew their support from Mr. Blaine, and indicated that they would cast their influence on the side of the Democratic candidate, in case some statesman of tried incorruptibility were chosen by the dem. convention. It was generally understood that either Grover Cleveland or Thomas F. Bayard would be acceptable to them. When the convention met in July, these two were the leading candidates on the first ballot. On the second ballot Mr. Cleveland secured the necessary two-thirds majority, and was declared the nominee. Thomas A. Hendricks, of Indiana, was nominated for Vice-President. Rival tickets were put in the field by the friends of total abstinence, who nominated John P. St. John, of Kansas, for President and William Daniel, of Maryland, for Vice-President; and by the Anti-monopoly and Greenback-Labor parties, both of which nominated Gen. Benjamin F. Butler, of Massachusetts, for President. The campaign which followed developed unusual excitement and party rancor. Charges of political immorality against one candidate were met with counter-charges of sexual immorality against the other. Mr. Blaine made a tour through the Western States, and spoke in the principal cities and towns. Mr. Cleveland preferred to let his friends electioneer, and appeared in only a few cities in New York, New Jersey, and Connecticut. The election was unexpectedly close, and the result for a few days hung in doubt over conflicting press returns in the pivotal state of New York; but the official count gave a plurality of 1047 to Mr. Cleveland.

The Democratic ticket received 219 electoral votes and the Republican ticket, 182. The Prohibition ticket had a popular vote of 151,809, and the Anti-Monopoly ticket of 133,825.

XXV.—ADMINISTRATION OF GROVER CLEVELAND (1885-1889). *Cabinet.*—*Secretary of State*, Thomas F. Bayard, Delaware, March 6th, 1885. *Secretary of Treasury*, Daniel Manning, New York, March 6th, 1885; Charles S. Fairchild, New York, April 1st, 1887. *Secretary of War*, William C. Endicott, Massachusetts, March 6th, 1885. *Secretary of Navy*, William C. Whitney, New York, March 6th, 1885. *Secretary of Interior*, Lucius Q. C. Lamar, Mississippi, March 6th, 1885; William F. Vilas, Wisconsin,

sin, January 16th, 1888. *Attorney-General*, Augustus H. Garland, Arkansas, March 6th, 1885. *Postmaster-General*, William F. Vilas, Wisconsin, March 6th, 1885; Don M. Dickinson, Michigan, January 16th, 1888.

Mr. Cleveland's administration from the outset was marked by a general application to the public service of the principles so long advocated by the friends of Civil Service reform. In 1882, the so-called Pendleton Civil Service bill had been passed, allowing the President to make his appointments on the basis of examinations conducted by a Board of Examiners established by him. Mr. Arthur had faithfully carried out the provisions of this act; and now Mr. Cleveland applied its principles to many offices not specifically covered by the act. For the first time in half a century, no sweeping changes were made in the public service on the accession to power of a new party.

In 1886, a bill passed Congress to regulate the succession to the presidential office—a question that assumed some special importance on the death of Vice-President Hendricks. For particulars, see under *Government* in this article. Among the important acts of this Congress were the Anti-Polygamy, or Edmunds Bill, making polygamy a criminal offense; and the Interstate Commerce (q. v.) Act, preventing discrimination in railroad freights and the practice of "pooling" freights by competing railroads. A tariff bill, known as the Morrison Bill, was defeated by Republicans and protection Democrats.

In December, 1887, President Cleveland sent to Congress a message devoted to the single question of the tariff. After stating that the estimated surplus in the Treasury in June, 1888, would be fully \$140,000,000, he declared the existing tariff laws to be the source of unnecessary taxation, and asked for a reduction of the duties on raw materials, especially on wool. In accordance with this recommendation, the so-called Mills Bill was introduced, and passed the House. It removed duties aggregating \$50,000,000 per annum, but failed to pass the Senate, which was Republican. At this session of Congress the largest appropriation for rivers and harbors ever known was made. It amounted to \$22,227,000, and became law without the President's signature. A new Chinese Exclusion Bill was also passed. An act was passed in 1889 for the admission of four new states—North Dakota, South Dakota, Washington, and Montana.

At the Democratic convention of 1888, Mr. Cleveland was renominated, with Allen G. Thurman, of Ohio, as the candidate for Vice-President. The Republicans nominated Benjamin Harrison, of Indiana, and Levi P. Morton, of New York. The Prohibition party put forward as its candidates, Clinton B. Fisk, of New Jersey, and John A. Brooks, of Missouri. The campaign was unusually free from offensive personalities, but was fought out largely on the tariff questions raised by Mr. Cleveland's message of 1887. Enormous sums of money, however, were used in the campaign. The election resulted in the choice of the Republican candidates, who received 233 electoral votes as against 168 cast for the Democratic nominees. The popular vote for Mr. Cleveland exceeded that of Mr. Harrison by 94,611. The Prohibition ticket received 246,406 votes.

XXVI.—ADMINISTRATION OF BENJAMIN HARRISON (1889-93). *Cabinet*.—*Secretary of State*, James G. Blaine, Maine, March 7th, 1889. *Secretary of the Treasury*, William Windom, Minnesota, March 7th, 1889; Charles Foster, Ohio, February 21st, 1891. *Secretary of War*, Redfield Proctor, Vermont, March 7th, 1889. *Attorney-General*, W. H. H. Miller, Indiana, March 7th, 1889. *Postmaster-General*, John Wanamaker, Pennsylvania, March 7th, 1889. *Secretary of the Navy*, Benj. F. Tracy, New York, March 7th, 1889. *Secretary of the Interior*, John W. Noble, Missouri, March 7th, 1889. *Secretary of Agriculture*, Jere. M. Rusk, Wisconsin, March 7th, 1889.

The administration of Mr. Harrison witnessed a remarkable growth of public interest in the foreign relations of the United States, both commercially and otherwise. One cause of this is to be found in the meeting of the so-called Pan-American Congress at Washington, Oct. 21st, 1890, under the presidency of Secretary Blaine, and which did much to foster a popular sentiment in favor of commercial reciprocity (q. v.) between the United States and the other American republics. This policy, warmly advocated by Mr. Blaine, found expression in the so-called "reciprocity section" of the bill for the revision of the tariff prepared by Mr. William McKinley (q. v.), of Ohio, which passed both houses of Congress and became a law, October 1st, 1890. Under this section, reciprocity treaties were negotiated with Brazil and Spain.

Several diplomatic difficulties of more or less seriousness had arisen between the United States and foreign powers within a few years. Among these had been a state of anarchy on the Isthmus of Panama, which required the United States government, in accordance with its treaty obligations, to send an armed force to protect the Isthmus. A dispute with Germany over the Samoan Islands (q. v.) in 1889 had also taken on a serious aspect, though finally arranged in an amicable manner by a treaty signed at Berlin (February 4th, 1890). A serious disagreement with England also arose in 1890-91, regarding the rights of this country acquired in Behring Sea by our treaty with Russia, and was referred to arbitration in 1891. The lynching of certain Italians by a mob in New Orleans, in the same year, led to something like a diplomatic rupture with Italy, which recalled its minister from Washington.

The same Congress arranged for holding a World's Fair at Chicago in 1893 in honor of the discovery of America by Columbus. On May 2d, 1890, the new territory of Oklahoma (q. v.) was organized, and Idaho (July 3d) and Wyoming (July 11th) were admitted as states.

The closing months of Mr. Harrison's administration were marked by some financial disturbances owing to the continued shipment of gold to Europe, which threatened to reduce the gold deposits in the United States Treasury below the limit of \$100,000,000, which had been held as a reserve fund to secure the payment of all treasury-notes in gold. Another event of interest was the overthrow of the monarchy in Hawaii by the foreign residents, and the application made by the new government for the annexation of the islands to the United States. Mr. Harrison sent a treaty of annexation to the Senate (Feb., 1893), but it was not acted upon. See SANDWICH ISLANDS.

The conventions of the two great political parties had been held in June, 1892. The Democrats nominated Grover Cleveland of New York for the presidency and Adlai E. Stevenson of Illinois for the vice-presidency. The Republican Convention renominated President Harrison for the presidency and selected Whitelaw Reid of New York as its choice for vice-president. The so-called People's Party (q.v.) nominated Gen. J. B. Weaver of Iowa and James G. Field of Virginia. The ensuing campaign was largely conducted on the question of the tariff, and resulted in the election of Cleveland and Stevenson, who received 277 electoral votes, as against 145 for Harrison and Reid, and 22 for Weaver and Field.

XXVII. SECOND ADMINISTRATION OF GROVER CLEVELAND (1893-97). *Cabinet.*—*Secretary of State*, Walter Q. Gresham, Indiana, March 6, 1893; Richard Olney, Mass. *Secretary of Treasury*, John G. Carlisle, Kentucky, March 6, 1893. *Secretary of War*, Daniel S. Lamont, New York, March 6, 1893. *Secretary of Navy*, Hilary A. Herbert, Alabama, March 6, 1893. *Secretary of Interior*, Hoke Smith, Georgia, March 6, 1893. *Attorney-General*, Richard Olney, Massachusetts, March 6, 1893; Judson Harmon, O.; *Postmaster-General*, Wilson S. Bissell, New York, March 6, 1893; William L. Wilson, W. Va., March, 1895; *Secretary of Agriculture*, J. Sterling Morton, Nebraska, March 6, 1893.

In his second administration the President applied himself particularly to the promotion of tariff and financial reforms, and this period was marked by the intense and persistent opposition of his own party in both houses of Congress. His earliest act of importance was the withdrawal from the Senate of the treaty for the annexation of Hawaii to the United States, which had been negotiated in the closing days of the previous administration. He also sent James H. Blount, ex-congressman from Georgia, to Hawaii as a special commissioner to investigate the circumstances of the overthrow of the royal government, and, on his report, took the ground that the U. S. government had through its representatives committed a grievous wrong against the kingdom.

The legislation on the tariff was the most exciting domestic incident of this term. A new bill, bearing the name of chairman Wilson, of the house committee on ways and means, and providing for free raw sugar, free wool, free coal, free lumber, and free iron ore, and reducing the duties on many articles in the existing schedules, was introduced Dec. 19, 1893. In the following month, a measure providing for an income tax was presented in the house, and that and others concerning the internal revenue were incorporated in the bill during the subsequent debate. When the bill reached the Senate it underwent radical alterations, many amendments being made, notably those imposing a tax on sugar, coal, and iron ore, and the house at first refused to concur in the Senate amendments. Finally, however, they withdrew from their position of non-concurrence and the bill was passed. Immediately afterward the house passed bills providing for free sugar, free coal, free iron ore, and free barbed wire. The President allowed the bill to become a law without his signature. On an appeal to the U. S. supreme court, that body, April 2, 1895, declared two provisions of the income-tax law unconstitutional, and upheld the remainder by a tie vote, and May 20, on a rehearing, declared the whole measure unconstitutional.

Early in the term occurred the great commercial panic of 1893 which was followed by a long period of depression. The financial feature of this administration (see MONEY), showed still greater opposition to the President, and provided the chief factor in the presidential campaign of 1896. In Jan., 1894, because of the heavy withdrawal of gold coin from the treasury and the large reduction in the gold reserve of \$100,000,000, Secretary Carlisle, of the treasury department, issued a call for the purchase of \$50,000,000 of 5 per cent. bonds, at \$117.223, and this sale resulted in the acquisition of \$58,660,917 in gold, which was added to the reserve. The drain on the reserve, however, continued, and in November following the secretary issued a second call for the purchase of \$50,000,000 bonds, when the subscriptions aggregated \$178,341,150 and the sale yielded \$53,538,500 in gold, which brought the reserve to \$111,142,021. In about two months after this sale the reserve declined to \$41,340,181. The President, in a special message to Congress, Jan. 28, 1895, recommended that authority be given the secretary of the treasury to issue bonds bearing a low rate of interest, to maintain the reserve and redeem outstanding notes issued for the purchase of silver; but Congress did not approve the recommendation. Secretary Carlisle then signed a contract with August Belmont & Co., and J. P. Morgan & Co., for themselves and others, to supply the government with 3,500,000 ounces of standard gold coin, at the rate of \$17.80441 per ounce, for 30-year 4 per cent. bonds, on the conditions that one-half of the coin should be obtained in Europe, and that if Congress should authorize their issue, bonds payable in gold and bearing 3 per cent. interest, might within 10 days be substituted at par for the 4 per cent. bonds. The President again urged Congress to authorize the issue of low rate

bonds, declaring in his message that more than \$16,000,000 in interest would be saved thereby, and Congress again withheld its sanction. Under the contract the secretary sold \$62,315,000 in bonds for a little over \$65,000,000 in gold. The subscriptions to this loan aggregated \$590,000,000 in London, and \$200,000,000 in New York. Under the continuance of the business depression, Secretary Carlisle was forced, in Jan., 1896, to invite proposals for the purchase of \$100,000,000 of 30-year 4 per cent. bonds. The awards were, to the Morgan syndicate \$37,911,350, and to other bidders the remainder.

The silver question came up again in Congress, Feb. 7, 1894, when the house committee on coinage, weights, and measures, reported a bill directing the coinage of the silver held in the treasury. A substitute by congressman Bland, providing for the coinage of the seigniorage was adopted, and passed in the house by a vote of 168 yeas to 129 nays, with 56 not voting, and in the Senate by 44 yeas to 31 nays, 10 not voting. This bill was vetoed by the President, and it failed of passage over the veto. In Dec., 1895, the house passed a bond bill prepared by the Republican members of its committee on ways and means, and when it reached the Senate the finance committee reported a free silver coinage substitute, which the Senate passed, Feb. 1, 1896, by a vote of 42 yeas to 35 nays. The house refused to concur in the substitute, and rejected it by a vote of 215 yeas to 90 nays. A few days afterward the Senate defeated the emergency revenue bill, prepared by Republican members of the house committee on ways and means, and passed by the house by a vote of 205 yeas to 61 nays, the Senate vote being 22 yeas to 33 nays.

A long standing dispute between Venezuela and Great Britain, over the British Guiana boundary line, was the cause of a presidential message to Congress in Dec., 1895, recommending the appointment of a commission to determine the divisional line between Venezuela and British Guiana. Both houses unanimously concurred in the recommendation, a commission was appointed Jan. 1, 1896, and the proceeding provoked great excitement in the countries interested for several months. Among other events of President Cleveland's second administration were the world's Columbian exposition at Chicago, and the great naval review at New York in 1893, the signing of treaties with China and Japan, in 1894, and the arbitration by the President of disputes between Brazil and the Argentine republic, Colombia and Italy, and Brazil and Italy.

The presidential campaign of 1896 was based principally on the problem: Sound money (gold) vs. the free coinage of silver at the ratio of 16 to 1. There were seven tickets in the field, viz., the Republican (sound money), William McKinley, of Ohio, and Garret A. Hobart, of New Jersey; the Democratic (free silver), William J. Bryan, of Nebraska, and Arthur Sewall, of Maine; the National Democratic (sound money), John M. Palmer of Illinois, and Simon B. Buckner, of Kentucky; the Prohibition, Joshua Levering and Hale Johnson; the Socialist Labor, Charles H. Matchett and Matthew Maguire; the Populist, William J. Bryan and Thomas E. Watson; and the Free Silver Prohibition, Charles E. Bentley and James H. Southgate. The total popular vote was 13,930,942 and the electoral, 447, of which the Republican candidates received 7,121,342 and 271 respectively, and the Democratic, 6,502,600 and 176. The Populist ticket received 144,928 votes; National Democratic, 134,731; Prohibition, 123,428; Socialist Labor, 35,306; and Free Silver Prohibition, 13,535.

XXVIII.—ADMINISTRATION OF WILLIAM MCKINLEY (1897—). *Cabinet*.—*Secretary of State*, John Sherman, Ohio; *Secretary of the Treasury*, Lyman J. Gage, Illinois; *Secretary of War*, Russell A. Alger, Michigan; *Secretary of the Navy*, John D. Long, Massachusetts; *Secretary of the Interior*, Cornelius N. Bliss, New York; *Attorney-General*, Joseph McKenna, California; and *Secretary of Agriculture*, James Wilson, Iowa.

Among the early important appointments of President McKinley were those of John Hay, to be ambassador to Great Britain; Horace Porter, ambassador to France; Andrew D. White, ambassador to Germany; William F. Draper, ambassador to Italy; James B. Angell, minister to Turkey; Stewart L. Woodford, minister to Spain; Whitelaw Reid, special ambassador to Great Britain on the occasion of the Queen's jubilee; William J. Calhoun, special commissioner to Cuba; and Ellis H. Roberts, treasurer of the United States.

In accordance with a proclamation by the President, Congress met in extraordinary session on March 15, 1897. A new tariff bill, bearing the name of Chairman Dingley of the house committee on ways and means, was introduced on the opening day, and was finally passed and signed by the President on July 24. In March the Senate Committee on Foreign Relations made a favorable report on the arbitration treaty between the United States and Great Britain, submitting several amendments with the report. These amendments were adopted; a large number of other amendments were subsequently proposed; and the treaty was rejected May 5 by a vote of 43 to 29. The President sent to the Senate, June 16, a new treaty with Hawaii for annexation; the Senate Committee on Foreign Relations reported a resolution for the ratification of the treaty, July 14; but Congress adjourned without further action on it. The treaty, however, was ratified by the unanimous vote of both houses of the Hawaiian legislature on Sept. 10, following. The Senate, May 17, passed a resolution recognizing the Cuban insurgents as belligerents by a vote of 41 to 14.

The reader is referred to the following works on American history and statistics :

EARLY AND COLONIAL HISTORY.—Brown, *The Genesis of the United States* (1891); Stevens, *Fac-simile of MSS. relating to the early History of America* (1891); Winsor, *A Narrative and Critical History of America* (1891); Dodge, *English Colonies*; Hildreth, *History of the United States* (1880); Marshall, *History of the Colonies* (1887); Scott, *Constitutional Liberty in the Colonies* (1882); Holmes, *Annals of America*; Force, *American Archives* (1851); Palfrey, *History*

of *New England* (1864); Parkman, *France and England in North America* (1865-88); Bishop, *History of the Mississippi Valley*; Winsor, *The Mississippi Basin* (1895).

GENERAL HISTORY.—Bancroft, *History of the Formation of the Constitution of the United States* (1882); id., *History of the United States* (1882); Bryant and Gay, *Popular History of the United States*; Fontpertuis, *Les États Unis d'Amérique Septentrionale* (1872); McMaster, *History of the People of the United States* (1883-); Schouler, *History of the United States* (1886-91); Spencer, *The United States* (to 1856); A. H. Stephens, *History of the United States* (1872); Adams, *History of the United States* (1891).

SPECIAL PERIODS AND TOPICS.—Frothingham, *The Rise of the Republic* (1881); Lossing, *Field Book of the Revolution* (1850); Carrington, *Battles of the American Revolution* (1876); King, *The Southern States of America* (1875); Adams, *Documents relating to New England Federalism*; Dwight, *The Hartford Convention* (1833); Ingersoll, *The Second War with Great Britain* (1849); Cairnes, *The Slave Power* (1862); Mansfield, *The War with Mexico* (1848); Ladd, *The Mexican War* (1883); Greeley, *Slavery Extension* (1856); Chittenden, *The Peace Conference* (1864); Benton, *Thirty Years' View* (1856); Appleton, *The Annual Cyclopædia* (1861-1890); Draper, *The Civil War in America* (1870); Wilson, *The Rise and Fall of the Slave Power* (1874); Greeley, *The American Conflict* (1866); Lunt, *The Origin of the Late War* (1867); Pollard, *A Southern History of the War* (1866); id., *The Lost Cause* (1866); Davis, *Rise and Fall of the Confederate Government* (1881); Stephens, *View of the War between the States* (1870); Blaine, *Twenty Years of Congress* (1884); *Battles and Leaders of the Civil War* (Century Co., N. Y., 1890); H. Bancroft, *History of the Pacific Coast* (1883-90); Grant, *Reminiscences* (1885); Roosevelt, *Naval History of the United States* (1885); Williams, *History of the Negro Race* (1883); Cooper, *History of the American Navy* (1856); Porter, *Naval History of the United States*; Wilson, *Division and Reunion* (1893).

BIOGRAPHIES.—Marshall, *Life of Washington*; Sparks, *Life of Washington*; Randall, *Life of Jefferson*; Adams, *Life of John Adams and Life of John Quincy Adams*; Sumner, *Life of Hamilton*; Rives, *Life of Madison*; Jay, *Life of John Jay*; Sparks, *Life of Gouverneur Morris*; Austin, *Life of Gerry*; Wirt, *Life of Patrick Henry*; Garland, *Life of Randolph*; Parton, *Life of Aaron Burr and Life of Andrew Jackson*; Curtis, *Life of Webster*; Lodge, *Life of Webster*; Von Holst, *Life of Calhoun*; Colton, *Life of Clay*; Schucker, *Life of Salmon P. Chase*; Pollard, *Life of Jefferson Davis*; McLaughlin, *Life of Lewis Cass*; Tyler, *Life of Taney*; Raymond, *Life of Lincoln*; Hay and Nicolay, *Abraham Lincoln, a History*; McCabe, *Life of R. E. Lee*; Long, *Memoir of R. E. Lee* (1887); Cooke, *Stonewall Jackson*; Badeau, *U. S. Grant*; Grant, *Reminiscences*; Spencer, *Life of T. F. Bayard*; Lanman, *Biographical Annals of the Civil Government of the United States* (1876), the volumes contained in the *American Statesmen* series, and in the *Makers of America* series; the personal narratives of Sherman, McClellan, Hood, Johnston, Beauregard; the memoir of Jefferson Davis, by Mrs. Davis; and the various biographical articles in this work.

CONSTITUTIONAL, POLITICAL, AND FINANCIAL.—Von Holst, *A Constitutional and Political History of the United States* (1879-85); Curtis, *History of the Constitutional History of the United States* (1854-58); Paschal, *The Constitution of the United States* (1868); Seaman, *The American System of Government* (1871); Towle, *History and Analysis of the Constitution of the United States* (1871); Cooley, *Constitutional Law in the United States* (1880); Pomeroy, *Constitutional Law of the United States* (1887); Bryce, *The American Commonwealth* (1888); Brackett, *Our Western Empire* (1882); Cooper and Fenton, *American Politics* (1882); Johnston, *History of American Politics* (3d ed., 1890); Lossing, *Cyclopædia of United States History* (1883); Lalor, *Cyclopædia of Political Science* (1886); Macpherson, *The Political History of the United States, 1860-64* (1864); Wharton, *International Law of the United States* (1887); Stanwood, *History of Presidential Elections* (1884); Callan, *Military Laws of the United States* (1880); Bolles, *Financial History of the United States* (1885); *Laws of the United States relating to Loans, Coinage, Currency, and Banking* (1886); Keltie, *The Statesman's Year Book* (1894); Poor, *Manual of the Railroads of the United States* (1891); *Statistical Abstract of the United States* (1894); *Official Register of the United States* (1893); *Report of the Bureau of American Republics* (1891); Lyman, *Diplomacy of the United States*; Van Buren, *Origin of Political Parties*; Capen, *Democracy* (1874); Gillet, *Democracy in the United States* (1868); Calhoun, *Works* (1855); Mulford, *The Nation* (1870); Hurd, *Theory of Our National Existence* (1881); Macpherson, *History of the U. S. down to Reconstruction* (1875); Harris, *Political Conflict* (1876); Andrews, *Handbook of the Constitution* (1852); Whiting, *The War Powers of the President* (1863); Fiske, *American Political Ideas* (1885); Gouge, *Banking in the United States* (1833); Scribner, *Statistical Atlas* (1886); H. C. Adams, *Public Debts* (1887); Gibbons, *Public Debt of the United States* (1867); Young, *Tariff Legislation of the United States*; Sumner, *History of American Currency* (1874); Wilson, *Congressional Government* (1885); id., *The State* (1889); Goldwin Smith, *Political History of the U. S.* (1893).

UNITED STATES, EXTENSION OF TERRITORY OF THE. Prior to 1781 only six of the 13 original states, viz. New Hampshire, Rhode Island, New Jersey, Pennsylvania, Maryland, and Delaware, had exactly defined boundaries. Of the remaining seven states, some claimed to extend to the Pacific ocean and others to the Mississippi river. The states within exact boundaries ceded their claim to lands w. of their present limits in succession, as follows: March 1, 1781, New York. March 1, 1784, Virginia; the cession including the state of Kentucky and the parts of the states of Illinois, Ohio, and Indiana which lie s. of the 41st parallel. Virginia reserved from this cession for

military bounty-lands the entire territory, 6,570 sq.m., between the Scioto and Little Miami rivers, from their source to the Ohio river. April 19, 1785, Massachusetts; including her claims to territory w. of the present boundary of New York. Sept. 14, 1786, Connecticut; the cession being the territory between the parallels of 41° and $40^{\circ} 2'$, and w. of a north and south line drawn 120 m. w. of the present w. boundary of Pennsylvania. Connecticut then ceded all land and jurisdiction w. of that territory, now situated in Ohio, and yet known as "the western reserve of Connecticut." Aug. 9, 1787, South Carolina; the territory ceded being a strip of land about 12 m. wide, s. of the 35th parallel and extending along the s. boundaries of North Carolina and Tennessee to the Mississippi. Feb. 25, 1790, North Carolina; the cession constituting Tennessee. May 30, 1800, Connecticut; yielding all territory and jurisdiction w. of her present area, and reserving the right of soil in the "western reserve," which lies between the parallels and meridians above recited. June 16, 1802, Georgia receiving that part of the cession of South Carolina lying within her present limits, ceded all between her present w. boundary and the Mississippi, and between the South Carolina cession and the 31st parallel. The foregoing cession secured to the general government all territory ceded by Great Britain, not included in the original 13 states, as in the main now bounded. Nov. 25, 1850, the state of Texas ceded all her claims to lands w. of the 26th meridian (103d Greenwich) and between 32° and $36^{\circ} 30'$ of latitude.

CESSIONS BY FOREIGN POWERS.—Sept. 3, 1783, by treaty with Great Britain, the territory of the United States was declared to extend from the Atlantic ocean w. to the Mississippi river, and from a line along the great lakes on the n. to the 31st parallel and the s. border of Georgia. April 30, 1803, by treaty with France, the "province of Louisiana" was ceded. Its w. boundary as finally adjusted, Feb. 22, 1819, by treaty with Spain, ran up the Sabine river, to and along the 17th meridian (94th Greenwich), to and along the Red river, to and along the 23d meridian (100th Greenwich), to and along the Arkansas river, to and along the Rocky Mountains, to and along the 29th meridian (106th Greenwich), to and along the 42d parallel, to the Pacific Ocean. Its n. boundary was conformed to the boundary established between the British possessions and the United States. On the e. it was bounded by the Mississippi as far s. as the 31st parallel, where different boundaries were claimed. The United States construed the cession of France to include all the territory between the 31st parallel and the gulf of Mexico, and between the Mississippi and Perdido, the latter of which is now the western boundary of Florida. Under this construction of the cession, the "province of Louisiana" is now covered by those portions of the states of Alabama and Mississippi which lie s. of the 31st parallel; by Louisiana, Arkansas, Iowa, Nebraska, Oregon, Minnesota w. of the Mississippi, Kansas, North and South Dakota, Montana, Idaho, Washington, and that country known as Indian territory; and by the portion of Colorado lying e. of the Rocky Mountains and n. of the Arkansas river, and all of Wyoming n. of the 42d parallel, and that portion of Wyoming which is s. of that parallel and e. of the Rocky Mountains. In 1800, however, the "province of Louisiana" had been ceded by Spain to France, Spain claiming that she ceded to France no territory e. of the Mississippi except the "island of New Orleans," and also contending that her province of west Florida included all of the territory s. of the 31st parallel and between the Perdido and Mississippi, except the "island of New Orleans." Under this construction, the "province of Louisiana" included on the e. of the Mississippi only the territory bounded on the n. and e. by the "rivers Iberville and Amite and by the lakes Maurepas and Ponchartrain." Feb. 22, 1819, Spain formally ceded the territory now covered by Florida and by portions of Alabama, and Mississippi, which lie s. of the 31st parallel, and by that portion of Louisiana which lies e. of the Mississippi and is not included in the "island of New Orleans." This territory was styled by Spain the "provinces of East and West Florida." Previous to this cession, by the authority of the joint resolution of Jan. 15, 1811, and the acts of Jan. 15, 1811 and Mar. 3, 1811, passed in secret session and first published in 1818, the United States had taken possession of the East and West Floridas. By treaty of Jan. 12, 1828, between the United States and the United Mexican states, the boundary of the "province of Louisiana," which was established by treaty with Spain when Mexico was a part of the Spanish monarchy, was agreed upon as the boundary between the two republics. Dec. 29, 1845, Texas, formerly a portion of Mexico, and later an independent republic, was admitted to the union. Feb. 2, 1848, Mexico ceded the territory now covered by California and Nevada; also her claims to the territory covered by the present Texas, by Utah, Arizona, and New Mexico, by portions of Wyoming and Colorado, and by the unorganized territory w. of the Indian country, except that part of Arizona and that part of New Mexico lying s. of the Gila and w. of the old boundary of New Mexico, which lands were ceded by Mexico Dec. 30, 1853, and are known as the Gadsden purchase. By treaty of March 30, 1867, exchange of ratification and transfer of title having been made June 20, 1867, Russia ceded Alaska. This cession made the line between the continent of Asia and America the n.w. boundary of the territory of the United States, and extending the territory of the United States northward to the Arctic ocean. On the e. this cession was bounded by a line beginning at the s. point of Prince of Wales island (parallel $54^{\circ} 40'$) and running n. along Portland channel to the junction of the 56th parallel of n. latitude with the continent, and thence along the summit of the mountains parallel to the coast, to and along the 141st meridian to the Arctic ocean.

But where the crest of the mountains skirting the coast from the specified parallel to the meridian is more than ten marine leagues from the ocean, there the boundary is a line not more than ten marine leagues from the coast and parallel to its windings. This cession is separated from the main territory of the United States by the w. part of the British possessions between the parallels of $54^{\circ} 40'$ and 49° n. latitude. At the close of the revolutionary war the territory really occupied by the old 13 states covered scarcely a quarter of a million sq.m.; according to the most trustworthy measurements and estimates in 1890 the land surface was 3,603,884 sq.m., and the water areas included made an area in round numbers of 4,000,000 sq.m., or 2,560,000,000 of acres.

UNITED STATES MILITARY ACADEMY, West Point, N. Y., founded by act of Congress approved Mar. 16, 1802. The experience of the country in the war of the revolution convinced Washington and other statesmen of the need of such an institution, and the act above referred to was the result of much thought and discussion. The special object of the academy is to fit young men for appointment as officers of the army. It combines in one school all the purposes usually aimed at in the several schools of engineering and other military branches in foreign countries. Its graduates, upon receiving diplomas, are recommended for, and usually appointed into, the corps or arm of service in the army for which their qualifications fit them. It has no endowment, but is maintained by annual appropriations. It is beautifully located in the highlands upon the w. side of the Hudson river, at a point which, during the war of the revolution, was deemed of great military strength and strategic importance. Its buildings, valued at \$2,500,000, stand upon a plateau of 160 acres, flanked by mountains at the w. and n., and elevated 180 ft. above the river. The chemical and ordnance laboratories, and the apparatus pertaining to the department of natural and experimental philosophy, are complete. The library contains 39,000 vols. and over 6000 pamphlets. One cadet is allowed by law to be appointed from each congressional district; also one from the district of Columbia, and one from each territory; and ten "at large" are appointed by the president of the United States. The appointments (excepting those *at large*) are made by the secretary of war at the request of the representative, or delegate, in congress from the district or territory; and the person appointed must be an actual resident of the district or territory from which the appointment is made. Candidates must be between 17 and 22 years of age, and must be at least 5 ft. in height, and free from any infectious or immoral disorder, and, generally, from any deformity, disease, or infirmity which may render them unfit for military service. They must be well versed in reading, in writing, including orthography, and in arithmetic, and have a knowledge of the elements of English grammar, of descriptive geography, particularly of our own country, and of the history of the United States. The course of study occupies four years, and the teaching is very thorough. Examinations are held semi-annually, and no cadet is graduated without having passed a satisfactory examination in all the branches taught. The institution, during the first ten or fifteen years of its existence, was of a tentative character; but in 1817 its organization began to improve under the superintendence of Maj. Sylvanus Thayer, who administered its affairs for 16 years with great success. In many of its best features the institution is to-day what it became under his management. The mode of selecting the cadets, while it serves to awaken and diffuse an interest in the institution in every part of the country, is not perhaps so well adapted to secure the highest order of ability. There is a constant tendency, difficult to be resisted, to make appointments on political or local grounds; and it is doubtless owing to this that so large a proportion of the cadets fail to reach the high standard of scholarship requisite for graduation. The monthly pay of cadets at first was \$28 per month; it is now \$45. On this sum they are required to support themselves without aid from other sources. A board of visitors, consisting of seven persons appointed by the President of the United States, two senators appointed by the president of the Senate, and three representatives appointed by the speaker of the house, attends the annual examinations and makes an annual report on the condition of the academy. The number of the staff (1897) was 66; other instructors are assigned by the war department from time to time as they are needed. The average number of students since 1876 has been about 270. Each cadet is required to pledge himself to serve the United States eight years from the date of his admission unless sooner discharged. Col. O. H. Ernest was (1897) the Superintendent.

UNITED STATES NAVAL ACADEMY, founded in 1845, and opened at Annapolis, Md., on Oct. 10, in that year. The idea originated with George Bancroft, who was Secretary of the Navy in the cabinet of Pres. Polk; and the institution was at first called the Naval School, under the direction of Commander Franklin Buchanan. It occupied Fort Severn, with its grounds and buildings, which had been transferred for the purpose from the war to the navy department; and though the barracks and other minor buildings have since been removed, the old fort and officers' quarters, with about 160 acres of land, are still appropriated to the uses of the academy. The institution bears the same relation to the U. S. navy, that the Military Academy at West Point does to the army. Its pupils are chosen under special provisions of the law, and educated expressly for the naval service. It resembles in its purpose and methods the Royal Naval College at Greenwich, Eng.; the *École Navale* at Brest, France; and the Marine Academy and School at

Kiel, in Germany. After numerous changes in the nature and length of the studies at the academy, a course of four years was adopted in 1850, to be followed by sea service as a midshipman; the length of the latter term being fixed at two years in 1873. From May, 1861, to Sept., 1865, during the war of the secession, the academy was temporarily placed at Newport, R. I. The naval academy is under the general patronage and control of the U. S. government, and is governed by special acts of Congress, and by regulations established by the secretary of the navy. Candidates for cadet-midshipmen are appointed by this official, from the congressional districts, on nomination by members of the house of representatives, and there is one from the District of Columbia. Ten candidates at large are appointed by the President. The examinations for admission are held at Annapolis in May and September. The applicant must pass examinations in the ordinary branches of education and must be free from defects of a physical nature. The academy is sustained by an annual appropriation by Congress, which usually amounts to about \$184,000; this is exclusive of the pay of naval officers acting under appointment as instructors, etc., which amounts to \$140,000 per annum; while the pay of cadets averages \$200,000; the whole being included in the general congressional appropriation. The buildings include cadets' quarters; physical and chemical laboratories; a steam-engineering department, observatory, gunnery-hall, seamanship hall, recitation hall, chapel, library, armory, gymnasium, store, and hospital. Attached to the academy for purposes of drill and practical exercise, are the *Monongahela*, a wooden sailing-vessel, and the *Bancroft*, a steel barkentine-rigged vessel with triple expansion engines and twin screws. On the latter vessel are torpedo and other guns of the latest pattern. The collection of working models of vessels of war, etc., is remarkably complete; and there is an ample supply of all needed apparatus and appliances for professional and general scientific instruction, including a thoroughly appointed astronomical observatory. The officers of the academy are the superintendent, commandant of cadets, and instructors and assistants in seamanship, ordnance, fencing, navigation, steam engineering, mechanics, physics, mathematics, English, languages, drawing, and physical training. The superintendent, commandant of cadets, and ten heads of departments form the academic board. There are also surgeons, paymasters, a chaplain, secretary, librarian, and marine officers, attached to the station. The number of students in 1896 was 255, including cadet engineers. The average annual number of graduates is 41, but in 1883 the number rose to 54. Graduates from the naval academy receive appointments as midshipmen or assistant engineers in the U. S. navy. The present (1897) superintendent of the academy is Capt. Philip H. Cooper.

UNITED STATES NAVY. See UNITED STATES.

UNITED STATES OF COLOMBIA. See COLOMBIA, THE REPUBLIC OF.

UNITY, a township in Allegheny co., Pa.; on the Allegheny Valley railroad; 14 miles e. of Pittsburg. It contains West Latrobe village and a part of Pleasant Unity village. Pop. '90, 5494.

UNIVALVES, in conchology, are those shells which consist of only one piece. They are mostly the shells of gasteropodous mollusks, but some cephalopodous mollusks also have univalve shells, as the argonaut and nautilus, and even animals belonging to other divisions of the animal kingdom, particularly a few annelids, as *serpula*; and the *foraminifera*. In systems of conchology, when the shell alone was regarded, the usual division of univalves was into *unilocular* and *multilocular*, the latter being the shells divided into chambers, as in the nautilus. The whole arrangement, however, was unnatural, bringing together in one group creatures widely different, and separating groups which in reality are very closely allied; for the mere presence or absence of a shell is often comparatively an unimportant circumstance, as in the case of snails and slugs. Yet by the mere shell, recent or fossil, the naturalist knows the group and order to which its occupant belonged, and can pronounce with confidence as to some of the habits of the animal. There are marked peculiarities in the univalves of different geological periods, well known and of great interest to geologists. See GASTEROPODA and MOLLUSCA.

UNIVERSALISTS, a body of Christians whose distinctive peculiarity consists in their belief that "evil" will ultimately be eradicated from the world, and that all erring creatures will be brought back to God through the irresistible efficacy of Christ's divine love. The grounds on which their faith in the final salvation of all men rests are derived more, perhaps, from reason than from Scripture; and when they *do* appeal to the latter, it is rather to the spirit and design of the Gospel than to particular passages. They argue, that when an infinitely wise, holy, and benevolent God resolved to create man, it could only be with a view to his everlasting good; that if he did allow him to be tempted and fall, it must have been because he foresaw that through sorrow and suffering man could rise to higher degrees of perfection; that therefore all punishment (or what, with our limited knowledge, we conceive to be such) is of necessity designed as a remedial agent, and not intended to satisfy God's indignation as a sovereign at the disobedience of his subjects; that no other view of the subject is compatible with the Scriptural, and especially the New Testament representation of God as a "Father," or with the oft-repeated declaration (in various terms) that Jesus Christ was a propitiation for the sins of the whole world. In answer to those who adduce against them the express language of

Scripture; e.g., "And these shall go away into everlasting punishment; but the righteous into life eternal" (Matthew, xxv. 46), they reply, that the word *aiónios*, translated "everlasting," does not necessarily bear that signification; that properly it does not express the idea of duration at all, either finite or infinite, but was rather used by the sacred writers to denote a mode of existence distinct from and wholly dissimilar to any mere *chronic* state; in proof of which they point to such passages as—"This is life eternal, that they might know thee, the only true God, and Jesus Christ, whom thou hast sent" (John, xvii. 3), where eternal life is affirmed to be *knowledge*—that is, a present state of mind, and not a perpetual hereafter of duration.

Universalists, it may be observed, generally differ from the prevalent bodies of Christians in other important doctrines, though it is not because of such differences that they have received their name, nor is it necessary to merit the name that one should share these differences. Most of them agree with Unitarians—but there are eminent examples to the contrary—in rejecting the doctrine of the trinity; they are also Pelagian in the matter of original sin, and reject the notion that the new birth is something supernatural.

Universalism, as a mode of belief, is of very ancient origin, and its modern adherents, besides urging its congruity with the divine plan of redemption, as revealed in Scripture, point to the earliest Christian writings; e.g., the *Sibylline oracles* (150 A.D.—see *SIBYL*)—expressly composed to convert pagans to Christianity—as evidence that the doctrine was recognized from the first. Passages in favor of the doctrine are cited from many of the church fathers—Clemens Alexandrinus; Origen; Marcellus, bishop of Ancyra; Titus, bishop of Bostra; Gregory, bishop of Nyssa; Didymus the Blind, president of the Catechetical School of Alexandria; Diodorus, bishop of Tarsus; Theodore, bishop of Mopsuestia; and Fabius Marius Victorinus. It is said to have been held by some of the Albigenses and Waldenses, the Lollards and the Anabaptists, and it probably had isolated supporters in most of the countries into which the reformation penetrated. Nor has it wanted illustrious adherents belonging to the church of England and the Non-conformists, among whom it is customary to rank archbishop Tillotson, Dr. Burnet, bishop Newton, Dr. Henry More, William Whiston, Jeremy White (chaplain to Oliver Cromwell), Soame Jenyns, David Hartley, William Law, and (in our own day) Thomas de Quincy and professor Maurice. The same remark is applicable to the French Protestant and German churches, and indeed it may safely be asserted that the *non-clerical* mind in all ages is disposed to look favorably upon the doctrine of the universal restoration to holiness and happiness of all fallen intelligences, whether human or angelic. But the existence of Universalism as a distinct religious sect is a feature of American rather than of English religious society. Universalists claim that their doctrine was preached in America by Dr. George de Benneville in 1741; that the Rev. Richard Clarke, an Episcopal clergyman of Charleston, S. C., maintained it for many years; and that Dr. Mayhew, a Congregational pastor in Boston, advocated it in 1762. The first Universalist church in the United States was organized by the Rev. John Murray, Gloucester, Mass., 1780. The first convention of Universalist ministers and parishes was held in 1785, and was followed by the general convention, whose present organization was formed in 1870. It secures a uniform system of fellowship, and is the ultimate tribunal. The state conventions have jurisdiction over clergymen and parishes within their respective limits, subject to the right of appeal. The Winchester confession, adopted in 1803, is as follows: "I. We believe that the holy Scriptures of the Old and New Testament contain a revelation of the character of God, and of the duty, interest, and final destination of mankind. II. We believe that there is one God, whose nature is love, revealed in one Lord Jesus Christ, by one Holy Spirit of Grace, who will finally restore the whole family of mankind to holiness and happiness. III. We believe that holiness and true happiness are inseparably connected, and that believers ought to be careful to maintain order and practice good works; for these things are good and profitable unto men." "Accepting this confession, the Universalist church claims to be thoroughly Christian in belief, holding inflexibly to the authority of the Bible, the divine mission and office of Christ, the absolute necessity of a holy life, the certainty of a just retribution for sin, and the assurance of the final triumph of good over evil, and holiness over sin, in all worlds, and all souls." The general convention holds funds, including the Murray Centenary Fund (amounting in 1889 to \$193,559), the interest of which is appropriated for the education of candidates for the ministry, for the support of missions, and for the distribution of denominational literature.

The statistical tables of the *Universal Register* for 1896 gave the following statistics: parishes, 1006; families, 45,405; members, 40,441; 59,370 Sunday-school scholars; value of church property, \$9,260,321. In 1891 the churches numbered 732 and the ministers 685. There are four colleges, including Tufts college at Medford, Mass., with an endowment of \$1,000,000; St. Lawrence university, Canton, N. Y.; and Buchtel college, Akron, O.; three theological schools and five academies, one of which, Dean academy, Franklin, Mass., has resources amounting to \$350,000. The theological and literary institutions have property valued at more than \$2,500,000. Six periodicals, the oldest of which is the *Christian Leader*, are published by the denomination. In 1886 a board of foreign missions was established, and in 1889 it was voted to hold the meetings of the general

convention biennially, and in the intervening year to hold a church conference, to discuss religion, morals, and education.

See Young, *Calvinism and Universalism Contrasted* (1793); Hosea Ballou, *Ancient History of Universalism* (2d ed., 1872); Whittemore, *Modern History of Universalism* (Boston, 1860); Thomas, *A Century of Universalism in Philadelphia and New York*; *Memoirs of Rev. Hosea Ballou*, by Whittemore and by Maturin M. Ballou.

UNIVERSAL LANGUAGE has been a subject of interest and attempt for more than 200 years. In 1650 a reward of 300 crowns was offered by one of the German princes for such a language. This was followed by the publication of a work of this character by the German linguist, Becker, in 1661, but with little result. In the same year a work appeared by George Habgarno, of Aberdeen; but the most noteworthy of these efforts was that of John Wilkins (q.v.), Bishop of Chester, in his "Essay Toward a Philosophical Language," published in 1668. Dr. Wilkins's language was entirely regular; but it was based on anthesis, and as all words do not suggest a well-defined anthesis, this principle involved a complexity and detail that amounted to an enormous folio volume, thereby rendering the language in the highest degree impracticable. Other attempts equally unsuccessful were made by Leibnitz, Faignet, Letellier, and the Englishman, Babbage. Others who have despaired of inventing a *spoken* language that should ever come into actual use, have attempted to arrange a universal written tongue, by means of which natives of different countries might be able to communicate by paper, even though they knew no word of each others' language. These attempts were based on the hieroglyphic system of expressing ideas by signs. Another system gave a verbal meaning to numbers; but all of these have failed by reason of their complex character. The most recent invention, and one which from its simplicity and uniformity promises to assume practical importance is the *Volapük* (q.v.), published in 1879 by Father Schleyer.

UNIVERSITY (Latin, *universitas*) is a term which, as originally used, denoted any corporate body, community, or association, regarded as a whole. The term, in its modern sense, began to be common in the fourteenth and fifteenth centuries to characterize a corporate body devoted to study, learning, and teaching, with the sanction of the church and state. The mediæval terms most usually found employed to describe a university are *universitas magistrorum et scholarium*, *studium generale*, *studii universitas*, and *universitatis collegium*.

UNIVERSITIES IN ANCIENT TIMES. It may seem odd to one unfamiliar with the subject to speak of the university in ancient times; but there was in reality at Athens, at the time of the Roman Empire, a university not only in all the essentials of a great centre of learning, but one that closely corresponded even to what we now mean by that word. Athens had always been what Pericles called "the school of Greece;" and in the early centuries of the Christian era it contained an organized faculty of accomplished professors who lectured to a body of students drawn from all portions of the civilized world. The university at Athens was the result of two previously existing institutions—the organization of the *Ephebi*, and the schools of the philosophers and sophists. The Ephebi, or free Athenian youths, were in early times enrolled into a body that was primarily intended for the defense of the State. They were educated both physically and mentally, and they formed the nucleus of what after became the student body of the university. Two changes in the constitution of this body prepared the way for its transformation from a quasi-military organization to a university. These changes were:

(1) The neglect of the principle of compulsion. Not all were enrolled, but only those who chose.

(2) Membership was no longer confined to Athenians or even Greeks.

These changes left a body of young men, organized and regularly enrolled, free to follow such a course of training as best suited their inclinations and capacities, and ready to be turned to any line of study that had the advocacy of brilliant, energetic, and popular men. The schools of the philosophers supplied the influence necessary for completing the change from a military college to a great university.

Four schools of philosophy had since the time of the Macedonian wars been flourishing at Athens. These were the Academic or Platonic School, the Peripatetic or Aristotelian School, the Stoic School and the Epicurean. Each of these schools from the time of its foundation had received an endowment sufficient to maintain and perpetuate it. Plato (q.v.) had purchased a small garden near the Eleusinian Way, in the grove of Academe, for 3000 drachmas. His philosophic successors, Xenocrates and Polemon, continued to teach in the same spot; their wealthy pupils and the friends of learning added to the grounds and bequeathed sufficient funds for the support of the philosopher, and thus practically endowed an academic chair. In like manner, Aristotle (q.v.) left to his successor, Theophrastus, the valuable property near the Ilissus; and Theophrastus in the will whose text has come down to us in Diogenes Laertius (V. 2.14) completed the permanent endowment of the Peripatetic chair. So Epicurus left his property in the Keramicus to be the nucleus of an endowment for his school (Diog. Laert., xx. 10), and the Stoics were probably in like manner made independent. Around these four schools of philosophy which, being endowed, taught gratuitously, a multitude

of teachers of rhetoric, grammar, literature, logic, physics, and mathematics clustered. The world soon learned to think of Athens as a great seat of learning and culture, brilliant and renowned. Students flocked to her from every quarter of the world. It appears to have been necessary to become enrolled among the *Éphebi*, but the scholars selected for themselves their own instructors, and attended such lectures as they chose. The number of these students became enormous. Theophrastus alone lectured to as many as 2000 men. The records show the names of many foreign students, some of them being of the Semitic race. The most noted writers of Rome had studied at this university, of whom Cicero, Ovid and Horace are perhaps the most brilliant names. The customs of the university may be gathered from a perusal of the works of Aulus Gellius, Libanius (A.D. 314), and Philostratus, author of the *Lives of the Sophists* (250 A.D.). From these sources we learn that matriculation took place early in the year; that the students wore a black gown like that of the undergraduates at the English universities; that they pursued athletic sports with much ardor; that at the theatre a special gallery was reserved for them; that certificates of attendance at the courses of lectures were required; that they were under the general direction of a President (*Cosmētēs*); that fees were exacted in the shape of an annual contribution to the University Library; that breaches of discipline were punished, as at Oxford, by fines; that the relation between student and Professor was very close, so that for a student to cease to take a course was very cutting; and that the students themselves "touted" for the Professors. "Most of the young enthusiasts for learning," says Gregory Nazianzen, "become mere partisans of their Professors. They are all anxiety to get their audiences larger and their fees increased. This they carry to portentous lengths. They post themselves over the city at the beginning of the year; as each new comer disembarks he falls into their hands; they carry him off at once to the house of some countryman or friend who is best at trumpeting the praises of his own Professor." (See Libanius, 1.13.)

Private tutors (*phylakes*) were often employed. They looked over the students' notes, "coached" them on the subjects in which they were most interested, and helped them at the exercises. At the end of the year there seems to have been an examination.

Freshmen seem to have been subject to a sort of hazing. Gregory, in a funeral address over his friend Basil, recalls some of the memories of their sport with freshmen. We find one of the Professors, Proëresius, asking his class not to haze a new student, Eunapius, because of his feeble health. Sometimes the inferior officers of the university were subject to similar annoyances, and Libanius tells of one of the tutors who was tossed in a blanket.

Many of the coincidences between ancient and modern university life are interesting. The following is a quotation from this same Libanius, who gives an account of how his classes conducted themselves:

"I send my Proctor to summon the students to my lecture, but they are in no mood to hurry, though they ought to be. They stay outside to sing songs which we have all heard till we are tired, or else amuse themselves with foolish merriment and jesting. This they do until the lecture has actually begun. Then they come in and keep whispering to one another, to the annoyance of the real students, about the races, or actresses, or opera dancers; or about some contest either past or future." And he adds very naively: "I had a very different class of students once. Perhaps some one may say that the fault is mine, and that my lectures are not as good as they used to be; but some of my best students now do not think so; they declare solemnly that I now quite surpass myself; and that while my lectures were always admirable, there is more in them now than there ever was before." (I. 199.)

Schools of philosophy and letters similar to those at Athens sprang up at other great cities in the later Roman empire—at Constantinople, at Alexandria, at Rhodes, and at Apollonia. See Capes, *University Life at Ancient Athens*; Mahaffy, *Greek Education* (1882); id. *The Greek World Under Roman sway* (1890); Painter, *History of Education* (1886).

MEDIEVAL UNIVERSITIES.—The university, in a modern sense, is usually considered to have originated in the 12th or 13th century, and to have grown out of the schools which, prior to that period, were attached to most of the cathedrals and monasteries, providing the means of education both to churchmen and laymen, and bringing together the few learned and scientific men who were to be found in Europe. Such an institute of the higher learning was at first called *studium* or *studium generale*. When a teacher of eminence appeared, such as Abélard or Peter Lombard at Paris, or Irnerius at Bologna, a concourse of admiring students flocked around him; and the members of the *studium generale* formed themselves, for mutual support, into a corporation on which the general name of *universitas* came to be bestowed. In this way the oldest universities arose spontaneously. The crowds drawn from every country of Europe to Paris, Bologna, and other educational resorts, had first local immunities bestowed on them for the encouragement of learning, and to prevent removal elsewhere; and the academical societies thus formed were, by papal bulls and royal charters, constituted an integral part of the church and state. One great difference existed between the constitution of the two most important universities of early times. In Paris, the teachers alone constituted the corporation; in Bologna, the university consisted of the students or scholars,

who at first held the supreme power, and appointed the academic officials. In this respect, Bologna became the model of the subsequent universities of Italy and the provincial universities of France, which were corporations of students; while the universities of Great Britain, Germany, Holland, and Scandinavia were, like that of Paris, corporations of teachers. The Spanish universities occupied an intermediate position. Along with a general resemblance, there was much difference in the constitution and character of the pre-reformation universities, the form of each being the result of a combination of various circumstances and ideas acting on an originally spontaneous convocation of teachers and scholars.

The several faculties of a university were subordinate corporations, consisting of the aggregate of students or teachers in a particular department of knowledge. The number of faculties has varied much in different universities. The University of Paris had at first only a Faculty of Arts, which, as early as 1169, existed as a separate body, with an organization of its own. Faculties of Theology, Medicine, and Canon Law were added in the 13th century. Bologna was at first exclusively, as it continued to be pre-eminently, a school of law. Oxford and Cambridge, in their origin, existed only in the Faculty of Arts. Some of the smaller French universities, as Orléans and Montpellier, were prohibited from teaching theology, lest they should become rivals to Paris.

The granting of degrees was the mode in which the university reproduced itself. A degree was the recognition of the fact that a student had made a certain advance in his career, the degree of doctor or master, in its original idea, entitling the person on whom it was conferred to teach within the limits of the university. Toward the end of the 13th century, Pope Nicholas I. granted to the University of Paris the right of endowing its graduates with the power of teaching everywhere; and this universal degree, making the recipient of it a member of the community of the learned throughout Christendom, became a link of connection between the universities of Europe. The designation of Bachelor, borrowed from the term indicating the probationary stage of knighthood, and implying the lowest stage of university honor, or the condition of an imperfect graduate, was first introduced in the 13th century in the University of Paris, where the bachelor, though intrusted with certain tutorial functions, possessed no legislative power. The right of teaching (*regendi*) belonged to the master, doctor, or other perfect graduate; and a period of necessary regency was generally fixed, during which the graduates were bound to teach, and after the expiration of which they were at liberty to become non-regents. It, in the course of time, became the practice to endow a select number of the graduates as public teachers; these privileged and salaried graduates were designated Professors, and instruction by Professors more or less supplanted the original plan of teaching by graduates.

The poverty of a proportion of the students, and the desirability of domestic superintendence, suggested the institution of Halls endowed with property and corporate privileges, called Colleges. Though originally a provision for poor scholars, they soon assumed the character of boarding-houses for all classes of students, where they were privately trained and prepared for the public lectures. Colleges seem to have been first introduced in Paris, where most of them became appropriated to a particular faculty, or department of a faculty. The College of the Sorbonne (q.v.), founded in 1250, came to be in a great measure identified with the Theological Faculty. Regent-masters were named by the faculties as lecturers in the colleges, attendance on whom was made equivalent to attendance on the public courses in the schools of the university; and eventually the college lectures were thrown open to all members of the university, and it became obligatory in the Faculty of Arts, and usual in the other faculties, to become a member of some college.

The highest university officers have generally been the Rector and the Chancellor, the former being the head of the university in everything except the granting of degrees, which are conferred by the latter as the fountain of honor. Besides the division into faculties, there was in most of the continental universities a division of the graduates and students into *nations*, in respect of the countries to which they belonged. In Paris, the Faculty of Arts was divided into four nations, known as French, Picard, Norman, and German or English; and after the 13th century, these four nations, under their respective procurators, and the three subsequently added faculties under their deans, constituted the seven component parts of the university. The Rector, with the Procurators and Deans, formed a court having cognizance of all matters relating to discipline, from which there was an appeal to the university, and from thence to the parliament of Paris. In Bologna, after faculties of philosophy, medicine, and theology had been added to those of civil and canon law, the students were classed as *ultramontani* and *citramontani*, and each class was divided into nations, presided over by their several Counselors or Procurators.

Details regarding the mediæval history of the universities of Europe will be found in the following sections of this article.

THE ENGLISH UNIVERSITIES. *Oxford.*—At the time when Oxford (q.v.) as a city, was losing its political and strategical importance, there was growing up within it a distinct, and destined often to be a hostile, corporation, which was to make it for centuries the intellectual capital of England. The word "university" implies now a corporate body of teachers and students, established for the pursuit of the higher branches

of learning, endowed with privileges and protected by charters granted by sovereign powers; and we find by the end of the 12th century and the beginning of the 13th, a corporation of this kind established in Oxford. But this corporation must have been only the official recognition of a guild of teachers with their pupils, which was already in existence in the city; and a guild of this kind must, in its turn, have been the development of accidental, and perhaps temporary, assemblages of teachers and students. The beginning of the University of Oxford, is therefore, to be carried as far back as the earlier third of the 12th century; Thibaut d'Estampes (Theobaldus Stampensis), about 1120, and Robert Pullein in 1133, being recorded as having taught in Oxford. The university, thus begun under Henry I. (who in 1130 built as a royal residence Beaumont Palace in the north suburb of Oxford, in which palace Richard Cœur de Lion was born in 1157), rapidly grew in numbers and in prestige; and by the beginning of the 13th century we find popes and kings interested in its fortunes, its scholars were numbered by thousands and not by hundreds, and the feuds between it and the town became often events of almost national importance. Teachers and scholars in this early university were of the secular clergy; they lived and taught in houses (Halls) and lecture-rooms (Schools) hired from the townsmen, and discipline was practically non-existent. The fame of the university attracted to Oxford the four great orders of mendicant friars immediately after their arrival in England—the Dominican (Black) Friars, coming in 1221, the Franciscan (Grey) Friars, in 1224, the Carmelite (White) Friars, in 1253, and the Austrian Friars, in 1268. The friars, unlike the older orders of monks who had stood aloof from secular learning, threw themselves with enthusiasm into the studies of the university; and the "schools" in their convents and their lecturers, soon eclipsed the fame of the secular schools and teachers. That Oxford can boast the greatest names in mediæval learning and legend, Roger Bacon and Friar Bungay, is due to these conventual schools. So threatening did the supremacy of the friars become, that the university in the early 14th century had a hard fight with them to retain the control of its own education.

The intellectual triumphs of the friars kindled the spark of emulation in the older monastic orders, and they in turn began to found conventual schools at Oxford for students of their own body. The Benedictines had four colleges in Oxford: Gloucester College, founded in 1283, part of whose buildings are now in Worcester College; Durham College, perhaps begun in 1290, partly now in Trinity College; Canterbury College, founded in 1363, now taken into the site of Christ Church, and St. Mary's College, founded in 1435, now a dwelling-house belonging to Brasenose. For the Cistercians, St. Bernard's College was founded in 1437, and parts of this building are still found in St. John's College.

The introduction into the university of the conventual system, with the severity of its discipline, the penetrating stimulus of its common life, and the efficiency of its personal tuition, suggested a change in the university of secular students, which was to effect in time an entire revolution in its form. In 1264, Walter de Merton conceived the plan of bringing together into a common home a number of secular students, engaged in academic studies, but subject to something like conventual discipline. In 1274 he moved his college which he had established at Malden in Surrey to Oxford. Two other institutions, which had been founded in Oxford at a slightly earlier date, soon, under the influence of the new idea, took the shape of Balliol and University Colleges. By 1525 ten other colleges had been instituted, among them such great designs as New College, Magdalen College, and Wolsey's Cardinal College, afterwards reconstructed by Henry VIII. as Christ Church, with a fraction of its former endowment. The Reformation, and the dissolution of the monasteries which it carried with it, destroyed half the glory of Oxford. Two abbeys, five friaries, and five monastic colleges ceased to exist; and the western and south-western quarters, which had contained the finest buildings of the city, became heaps of stones out of which the citizens of Oxford quarried building material. During the Romanist reaction under Queen Mary, something was done to repair the loss thus inflicted: Trinity College in 1554, and St. John's in 1555, restoring to Oxford Durham College and St. Bernard's College. Jesus College, founded nearly twenty years later, in Elizabeth's reign, was the first of the Protestant colleges. The more settled times of the early Stuarts patronized the gown more liberally; Wadham College coming in 1613, Pembroke in 1624. Then came the great catastrophe of the civil war, when learning and the encouragement of learning ceased. The years passed to 1714 before a new foundation arose in Oxford, in Sir Thomas Cooke's Worcester College; and, except for the abortive attempt (1740-1818) to erect Hart Hall into a college, that example found no imitator till our own times, when the foundations of Keble College in 1870 and of Hertford College in 1874, followed by the transference to Oxford of Mansfield College and of Manchester New College (though these two colleges are not incorporated in the university), bear witness to the new life which has begun to throb alike in the Anglican Church and in Nonconformity.

In Elizabeth's reign, and still more under the Stuarts, we have to mark a very strong desire on the part of the supreme power to compel all students in the university to reside within the walls of the colleges and the halls (then five in number, now reduced to two). The strong opposition of minorities, in matters both of polity and faith, rendered English sovereigns and their ministers suspicious and intolerant of students and teachers who were not directly under their control; and to secure this control they

required that all students should reside in the colleges where they were under the charge of governors appointed by court influence and responsible to the court. From this time, therefore, we have to date the disappearance of the old university and the development of that peculiarly English form, a university of colleges.

In the following six features the two great English universities stand in marked contrast to the universities out of England: (1) *The College System*. Before a person becomes a member of the university he must first of all become a member of one of the twenty-one colleges or two halls; and the moment he ceases to be a member of one of these societies, his actual membership of the university is also terminated. This means that the undergraduate is not left as a unit in a great body of two or three thousand, but is made a member of a much smaller body of perhaps eighty to two hundred members, and is therefore subject to closer personal scrutiny and to stronger influences of social opinion than would be possible in universities differently constructed. It is true that the influence of this common life is partially discounted in the case of students from the public schools, where similar influences have already formed their character; but in the case of students from small schools or solitary homes, the vigorous social life of a good college is wonderfully efficacious in converting the raw, diffident, or morose boy into the frank, self-reliant, and sociable man. (2) *The Fellowship System*. Formerly every first-class man (and many in the second class) could count with certainty on his fellowship, that is, on a secure endowment (for a shorter or longer period) which would enable him to pursue his studies, or to prepare himself for professional life. Some few of these fellowships are still open to competition; but the regulations of the Commission of 1877, which suppressed many fellowships to found professorships, coinciding with the loss of more than a third of the annual revenues of the colleges from the fall in agricultural rents, have seriously reduced their number, and so far, deprived Oxford of her best feature. (3) *The System of Tuition*. In American and Continental universities the work of tuition is undertaken by university teachers, i.e., by the professors. In Oxford and Cambridge the professoriate has withdrawn itself from any real share in this work, and, so far as concerns the mass of students, might be entirely suppressed without in any way affecting their studies. In all ordinary subjects, speaking generally, the professors have long ceased to give systematic instruction, and have at most expounded some small, and to the ordinary student often unnecessary, point in their subject. It is plain that from two lectures a week, delivered through at most three terms of seven weeks each, a student can learn little in language, in history, in philosophy, or in science. The work of tuition, which in other universities is discharged by the professors, is in Oxford and Cambridge discharged by the college lecturers. Formerly a college lecturer lectured only to the men of his own college; a system which was terribly unfair to the students of an inefficient college. Of late years, the better college lectures have become practically open to the whole university, and, especially in lectures connected with the honor schools, frequently without fee. The college lecturers of Oxford are therefore the professors of Oxford, except that they are not called by that name, and that they are paid by their college, not by the university. At the same time, the old Oxford tradition of a college tutor devoting himself to the interests of the men of his own college still continues. Apart from attendance at lectures, a large portion of the Oxford tuition consists in taking compositions, translations, papers, and essays, either individually or in very small classes, to one's tutor or lecturer. This individual instruction involves, it is true, an expenditure of time and talent which seems out of all proportion to the results it achieves, yet the happiest memories of Oxford men are probably those half-hours or hours in their tutor's rooms, when their individual faults were exposed by the large scholarship, and their individual eccentricities corrected by the unsparing but good-natured chaff of a kindly mentor. One result of the remarkable improvement in college tuition of the last few years has been the almost total disappearance of the "private coach" from the honor-work of the university. Private coaching continues to a great extent in the pass schools, partly because some candidates have been very badly taught at school and are below the level of their fellows, but chiefly because candidates are too idle to read by themselves. Quite a recent development of the professoriate deserves notice here. When the university has resident in it a man of special reputation in a given branch of study, the common university fund has of late years appointed him to lecture for three or five years in his own subject. In some cases undergraduate-Oxford has not seconded this by attendance at these lectures, but the approval of maturer scholars has followed this public recognition of learning. Such lecturers are known by the new title of Readers. (4) *Discipline*. The discipline of the English universities is much stricter than that of any university outside of England. Within college the government of the college deans, and without college the vigilance of the proctors and their deputies, repress disorder and immorality. (5) At the same time, Oxford and Cambridge, but especially Oxford, must be noted for the excessive luxury and idleness of the students. The common life of the colleges has this disadvantage, that it requires considerable force of character for a poor student to live in proportion to his poverty, there being every inducement for a man of weak character to live after the fashion of his richer and more careless contemporaries. Hence, the son of a man of £400 a year often spends during his course at the rate of the son of £4000 a year, and begins his after-life under a heavy burden of debt. And, lastly,

amusements of different kinds—football, rowing, cricket, tennis, billiards, card-playing, debating, the theatre, to say nothing of the baser kinds, such as betting, wine, worrying rats and rabbits, are thought of, talked of, and pursued by many undergraduates, till barely an hour a day in the eight weeks of term is left for any serious or intellectual pursuit. For this devotion to amusements the public schools are largely responsible. (6) The course is entirely out of touch with the professional education of the country. The Oxford undergraduate, for instance, entering the university at nineteen or twenty, finds himself at twenty-three or twenty-four, after the expenditure of £800 or £1000, and the formation of idle habits and expensive tastes, with his whole life to begin afresh. If he wishes to enter the church, he has generally to spend some years in a theological college; if he desires to go to the bar, he must proceed to the Inns of Court; if he intends to practice medicine, the long and expensive training of the London hospital schools has to be gone through.

Scholars and exhibitioners are admitted to a college without a special entrance examination; intending commoners are examined in some form or another by the college tutors. In some colleges it is enough to have passed Responsions, or equivalent examination; in others a further test is imposed, and some few colleges accept candidates in the hope that they will in the course of a term or two pass Responsions. But the practice of colleges varies so much from year to year that personal inquiry about the exact nature of the entrance examination is always advisable and generally necessary.

At Oxford, after admission, there opens up a perplexing variety of courses which lead to the degree; but the general rule will be found to hold good: "avoid any new-fangled course introduced by council, and proceed along the old beaten paths." Under present arrangements the degree is reached by three examinations: (1) Responsions, familiarly termed "smalls." This is a preliminary examination in the elements of Latin, Greek, and mathematics. It can be passed before coming into residence by means of various school examinations, or presenting one's self as a candidate for matriculation from a college. It ought always to be passed before matriculation, except in those cases where the instruction available is so bad that a pass is hopeless under it. (2) After Responsions the candidate has before him the examination which the statutes call the "First Public Examination," but which men call Moderations ("Mods"), or an equivalent examination. Here it is necessary to decide whether a candidate shall (a) take an *Honors examination* in the middle of his course, (b) take a *Pass examination* at that point, or (c) take an examination which implies taking an Honors examination at the end of the course. The decision must be made according to the candidate's attainments, guided by the shrewd advice of his college tutor. In the first case (a) there are honors to be had in classics and mathematics (or in both, if the candidate read double) in the course of the second year; in the second case (b) a further examination in classics, with the addition of the elements of logic or some further mathematics has to be passed, and this ought to be done in the fourth term of residence; in the third case (c) there is what is called a preliminary examination in law or in science giving admission to the final honor schools. All candidates, whether pass or honors, have at this stage to pass an examination in a small portion of Scripture, or an alternative examination provided for those who object to this examination in religion. (3) In the final examinations, officially termed the "Second Public Examination," but colloquially "Greats," the distinction between pass and honors is very marked. For the pass degree a candidate has to obtain a pass in three schools, of which one must be a language school (Classics, French, or German), and the other two may be chosen from divinity, history (ancient or modern), political economy, law, or various branches of natural sciences. For the honors degree the candidate may choose one or more of the schools of classics (officially termed "*Litteræ Humaniores*," including not only the languages, but the history and philosophy of Greece and Rome), mathematics, natural science, law, modern history, theology, oriental languages. Of these the most coveted distinction is the first "*in Classical Greats*," traditionally the chief Oxford school, for which most scholars and exhibitioners are required to read, and by examination in the subjects of which most of the few open or "prize" fellowships are awarded.

The traditional "double first," i.e., a first-class in classics and mathematics, when there were no modifications and only these two final schools, such as was won by W. E. Gladstone in 1831 and by Dean Liddell in 1833, is now forgotten; and as many as three, four, or even five firsts are attained without bringing the successful candidate much reputation in the university, or even a fellowship.

Candidates entering for an Honor School, and failing to get honors, may be either "ploughed," i.e., rejected entirely, or "gulfed," i.e., allowed a stage in the pass degree. If a candidate in any school despairs of his chances, he can "scratch," i.e., remove his name from the list of candidates. In many of the schools, both pass and honors, there is a *viva voce* examination, as well as a written examination. In the final honor schools candidates who have broken down in health may obtain an "ægrotat" certificate allowing them to proceed to their degree.

Recent statistics regarding the university will be found in the article, OXFORD UNIVERSITY.

Cambridge.—Authentic records relating to the origin of a university at Cambridge are entirely wanting, and their place has been supplied by tradition. But, overlooking

the various legendary accounts of its origin, it is probable that the true history of the university begins in the 12th century. Certain writs of Henry III. of 1231, are the earliest record of an attempt to introduce discipline amongst the students attending the lectures. It was about this time that the students, who had previously lived each in his own lodging at his own charges, began to live together in hostels under the rule of a principal. These hostels were named after the saints to whom they were dedicated, and the churches which they adjoined, or the persons who built or formerly possessed them. In the year 1280 there were as many as 27, and some of them contained from 20 to 40 masters of arts, and a proportionate number of younger students; but all these hostels decayed by degrees, when endowed colleges began to appear. Some were absorbed by the colleges, and some ceased to exist. Trinity Hostel survived all the rest, and continued till 1540.

A college is at Cambridge an incorporated body of teachers and students enjoying the benefactions of a generous founder. Peterhouse, the oldest college in the university, was founded in 1286; and it was between the middle of the 13th and the close of the 16th century that, with one exception, all those royal and religious foundations were endowed which superseded the hostels and now constitute the university.

The colleges were to a large extent modeled on the pattern of the monasteries. In some instances the colleges were united with "religious houses" already existing, as in the case of Magdalen College, at Oxford and Emmanuel College, at Cambridge. Hence arose some of the peculiarities of the college-system, which survived till a very recent date. To this cause is to be traced the condition of celibacy, upon which, with few exceptions, the fellowships were formerly tenable. The final abolition of restrictions as to marriage and as to holy orders (except in the case of offices with clerical functions) took place in 1881, when new statutes were issued by the Cambridge commissioners under the Universities of Oxford and Cambridge Act, 1877. These statutes take the place of those confirmed by the queen in council in 1858.

The endowment of university professorships dates from the 16th century. In 1502, Lady Margaret, mother of Henry VII., founded the Lady Margaret professorship of divinity. Henry VIII., in 1540, founded the five regius professorships of divinity, civil law, physic, Hebrew, and Greek. The earliest mathematical professorship was that founded by Henry Lucas in 1663. The university has 35 professors, increased to 40 by the statutes of 1881, in addition to readers, demonstrators, and assistants.

During the last half century the university has been reformed to meet modern needs, both by external authority and upon its own motions. Religious tests have been abolished, the field of study has been widened, non-collegiate students (see below) have been admitted, and the examinations have been thrown open to women.

In order to understand the constitution and organization of the university, it is necessary to bear in mind the fundamental distinction between the university and the colleges, due to the historical conditions of their respective origins. The governing body of the university is the Senate, which is composed of persons of the standing of masters of arts. The matters of which the Senate has cognizance are the management of the property of the university, the courses of study and examinations to be pursued by those who seek a degree, and public discipline and morals. But all proposals submitted to the Senate must be approved by the Council—a body elected by the resident members of the Senate. After the Chancellor and High-steward, the chief executive power is vested in the Vice-chancellor, who is elected annually from among the heads of colleges, but in practice holds office for two years. The Public Orator is the voice of the Senate upon public occasions. The Proctors superintend the discipline and morals of all persons *in statu pupillari*; they are present at all congregations of the Senate, read the graces, and take the votes. The Registry is responsible for the graces being offered in due form, and has charge of the university records. There are three terms in this university—the Michaelmas or October term, the Lent term, and the Easter term. To take an ordinary B.A. degree, a student must reside nine terms. The M.A. degree follows, without examination, about four years after. Dissenters are not now excluded from taking degrees, except in divinity. The university sends two members to parliament, who are elected by the Senate.

Each college is governed by its Master and Fellows, or by the Master and Council, a select committee of the Fellows. When questions arise as to the interpretation of the statutes, they are referred to the Visitor of the College. The college officers concerned with questions of discipline are the Dean and Tutor. The Tutor of the college is *in loco parentis* to his pupils; the Dean has the oversight of religion and morals.

With respect to the admission of students, their university course, expenses, and proceedings in degrees, the following information may be useful: There are five classes of students, viz.: *Fellow Commoners* and *Noblemen*, *Scholars*, *Pensioners*, *Sizars* and *Subsizars*, and *Non-collegiate Students*. The first class (now almost obsolete) are so called from their dining at the Fellows' table; they wear silk or embroidered gowns, and pay heavier fees. The Scholars are members of the foundation, and are elected, after examination, from the Pensioners and Sizars, or from students who have not yet begun residence. The Pensioners are the great body of students, are not in the foundation, and pay for their own commons—dinners in hall, etc., and for their rooms. The Sizars are poorer students, selected, however, by examination, who receive free com-

mons and certain money payments, are admitted at lower charges than the Pensioners, but wear the same dress, and are no longer subject to the performance of menial offices, as they once were. Some of the colleges, especially St. John's and Trinity, have very liberal endowments for the Sizar, and very considerable pecuniary assistance is given to the more deserving of them. Non-collegiate students are not members of any college, but are entitled to the privileges of members of the university, and are placed under the charge of the Censor of non-collegiate students. The system of non-collegiate students dates from 1869. The usual age of admission is from 17 to 20. Before a student can be admitted, he must at nearly all the larger colleges pass an elementary entrance examination. Where there is no entrance examination, the student is required to furnish satisfactory evidence that he is qualified for admission. It is also necessary to deposit a certain sum of money (£15 in the case of the Pensioners) with the tutor of the college as caution money. The Fellows are elected from the students who have distinguished themselves in the Tripos examinations, or in a special fellowship examination. Vacancies are, as a rule, filled up from members of the college, but fellowships are sometimes open to the competition of the whole university. Fellowships vary greatly as to value and conditions of tenure at the different colleges. The stipend, which can seldom exceed £250 per annum, has in many instances been seriously reduced through agricultural depression. Under the statutes of 1881, restrictions as to marriage and holy orders are done away with, and the length of tenure is limited to six years. The last regulation does not apply to Fellows holding a university or college office.

About half of the total number of undergraduates have rooms in college; the remainder reside in lodgings, but under the same rule as to discipline. Residence is usually commenced in the October term. The undergraduate in his first year of residence is called a "Freshman," in his second year, a "Junior Soph.," in his third year, a "Senior Soph." The Ordinary B.A., or Bachelor of Arts degree, may be taken in the ninth term of residence—viz., in the third June after coming up. The examinations required are: (1) The Previous Examination or "Little-go" (usually taken in the first or third term of residence), the subjects for which are a Gospel in Greek, a Greek classic, a Latin classic, Greek and Latin Grammar, unprepared passages of Latin to be translated; Paley's *Evidences of Christianity*; Euclid, Books I., II., III., and parts of V. and VI.; Arithmetic and Elementary Algebra. Those who wish may substitute a Greek classic and logic for the Greek Gospel and Paley. (2) The General Examination in more advanced Classics and Mathematics. (3) A Special Examination in one of the following subjects: Theology, Logic, and Political Economy, Law and Modern History, Chemistry, Botany, Zoology, Geology, Applied Science, Music. Candidates for Honors have to pass certain additional mathematical subjects in their "Little-go," and then have no further examination till the "Tripos." Honors may be taken in any of the following Triposes: Mathematics, Classics, Moral Sciences, Theology, Law, History, Semitic Languages, Indian Languages, Mediæval and Modern Languages. The lists of the Mathematical Tripos have been preserved since 1747; the Classical was established in 1824; the others are more recent. Previous to 1851, candidates for classical honors must first have obtained a place in the Mathematical Tripos. The system upon which the Mathematical and Classical Triposes are conducted dates from 1882, though the regulations for the Mathematical Tripos have been somewhat modified since that year. The Mathematical Tripos is divided into two parts. The first part takes place in May at the close of the third year, or ninth term of residence, and the successful candidates are arranged in three classes, called Wranglers (q.v.), Senior Optimes, and Junior Optimes, the members of each class being also placed in order of merit. Only those who have obtained honors in the first part may proceed to the second part of the examination in the following May. The subjects for this part are divided into eight divisions, excellence in any two of which entitles to the highest honors. According to their success in this examination, the candidates will be re-arranged in three classes, each class containing one or more divisions, the names in each division being, however, in alphabetical order. The Classical Tripos consists of two parts—the first in general classical scholarship, and taking place at the end either of the second or of the third year of residence; the other at the end either of the third or of the fourth year, and including, besides a further examination in pure classics, obligatory on all candidates, a special knowledge of one or two, but not more than two, of the following subjects: Ancient Philosophy, History, Archæology, Philology. The successful candidates in each part are arranged in three classes. In the first part, the examiners may indicate differences of merit within the classes by subdividing the classes into divisions; in the second part the names are given in alphabetical order, the subjects being indicated in which the student has specially distinguished himself. The Natural and Moral Sciences Triposes, the Theological Tripos, and (after 1889) the Law Tripos are also divided into two parts—a general and a special. The Mathematical and Classical Triposes were formerly followed by examinations for the Smith Prizes for Mathematics and the Chancellor's classical medal. The former are now awarded for the best dissertation on a mathematical subject, the latter by an examination in the student's ninth term.

Girton and Newnham Colleges for ladies are no part of the university. (See COLLEGIATE EDUCATION FOR WOMEN.)

Durham.—As early as the year 1650, an endeavor had been made to bring about the

foundation of a university in the north of England for the benefit of the counties remote from Oxford and Cambridge. Manchester and York both petitioned to be made the seat of the new centre. Oliver Cromwell, however, rejected both petitions, and decided in favor of Durham. Here he founded the University of Durham (1657), endowing it with the confiscated revenues of the Dean and Chapter of the cathedral, and entitling the corporation "The Mentor or Provost, Fellows and Scholars of the College of Durham, of the foundation of Oliver Cromwell." This scheme was canceled at the Restoration, and not revived until the present century; but on the 4th of July, 1832, a bill for the foundation of a university at Durham received the royal assent, the Dean and Chapter being empowered to appropriate an estate at South Shields for the establishment and maintenance of a university. The foundation was to be directly connected with the cathedral, the bishop of the diocese being appointed visitor, and the Dean and Chapter, governors; while the direct control was vested in a Warden, a Senate, and a Convocation. A college modeled on the plan of those at the older universities and designated University College, Durham, was founded in 1837, Bishop Hatfield's Hall in 1846, and Bishop Cosin's Hall in 1851. The last-named no longer exists. The university includes all the faculties, and in 1865 there was added to the Faculty of Arts, a School of Physical Science, including pure and applied mathematics, chemistry, geology, mining, engineering, etc. In 1871, the corporation of the university, in conjunction with some of the leading landed proprietors in the adjacent counties, gave further extension to this design by the foundation of a College of Physical Science at Newcastle-upon-Tyne, designed to teach scientific principles in their application to engineering, mining, manufactures, and agriculture. Students who had passed the required examinations were made admissible as associates in physical science of the university. There is also a medical college which stands in similar relations to Durham, of which university Codrington College, Barbadoes, and Fourah Bay College, in Sierra Leone, are likewise affiliated colleges.

London.—The University of London had its origin in a movement set on foot in 1825 by Thomas Campbell, the poet, in conjunction with Henry (afterwards Lord) Brougham, Mr. (afterwards Sir) Isaac Lyon Goldsmid, Joseph Hume, and some influential gentlemen, most of them connected with the congregation of Dr. Cox, of Hackney. The scheme was originally suggested by the fact that dissenters were practically excluded from the older universities, but the conception, as it took shape, was distinctly unsectarian. The first Council, appointed in December, 1825, comprised names representative of nearly all the religious denominations, including (besides those above mentioned), Zachary Macaulay, George Grote, James Mill, William Tooke, Lord Dudley and Ward, Dr. Olinthus Gregory, Lord Lansdowne, Lord John Russell, and the Duke of Norfolk. On the 11th of February, 1826, the deed of settlement was drawn up; and in the course of the year seven acres, constituting the site of University College, were purchased, the foundation stone of the new buildings being laid by the Duke of Sussex, April 30th, 1827. The course of instruction was designed to include "languages, mathematics, physics, the mental and moral sciences, together with the laws of England, history and political economy, and the various branches of knowledge, which are the objects of medical education." In October, 1828, the college was opened as the University of London. But in the mean time a certain section of the supporters of the movement, while satisfied as to the essential soundness of the primary design as a development of national education, entertained considerable scruples as to the propriety of altogether dissociating such an institution from the National Church. This feeling found expression in the foundation and incorporation of King's College (August, 1829), opened Oct. 8th, 1831, and designed to combine with the original plan, instruction in "the doctrines and duties of Christianity as the same are inculcated by the United Church of England and Ireland." This new phase of the movement was so far successful that in 1836 it was deemed expedient to dissociate the University of London from University College as a "teaching body," and to limit its action simply to the institution of examinations and the conferring of degrees—the college itself receiving a new charter, and being thenceforth designated as University College, London, while the rival institution was also incorporated with the university, and was thenceforth known as King's College, London. In the charter now given to the university it was stated that the king "deems it to be the duty of his royal office to hold forth to all classes and denominations of his faithful subjects, without any distinction whatsoever, an encouragement for pursuing a regular and liberal course of education." The charters of the University of London and of University College, London, were signed on the same day, November 28th, 1836. In 1869 both colleges gave their adhesion to the movement for the higher education of women which had been initiated elsewhere, and in 1880, ladies were for the first time admitted to degrees. (See COLLEGIATE EDUCATION FOR WOMEN.) It will be seen, therefore, that the University of London, properly so called, closely resembles the examining body known as the University of the State of New York. See REGENT.

Victoria University.—The Victoria University took its origin in the institution known as Owens College, Manchester—so called after a wealthy citizen of that name to whom it owed its foundation. The college was founded March 12th, 1851, for the purpose of affording to students who were unable, on the ground of expense, to resort to

Oxford or Cambridge, an education of an equally high class with that given at those universities. The institution was, from the first, unsectarian in character. In July, 1877, a memorial was presented to the Privy Council praying for the grant of a charter to the college, conferring on it the rank of a university, to be called the "University of Manchester." The localization implied in this title having met with opposition from the Yorkshire College at Leeds, it was resolved that the university should be called the "Victoria University." Under this name the foundation received its charter April 20th, 1880. The characteristic features of the Victoria University, as compared with other British universities are these: (1) it does not, like the University of London, confer its degrees on candidates who have passed certain examinations only, but it also requires attendance on prescribed courses of academic study in a college of the university; (2) the constitution of the university contemplates its becoming a federation of colleges; only these colleges will not be situated, like those of Oxford and Cambridge, in one town, but wherever a college of adequate efficiency and stability shall have arisen. University College, Liverpool, and the Yorkshire College, Leeds, having fulfilled these requirements, have become affiliated with the university. The Victoria University, like the other bodies in England and Scotland, is at once a teaching and an examining body, and there is an intimate relation between the teaching and the examining functions. To give it a general or national character, the governing body consists partly of persons nominated by the Crown, and partly of representatives of the governing and teaching bodies of the colleges and of the graduates of the university. External examiners are appointed who conduct the examinations in conjunction with examiners representing the teaching body. The graduates of the university meet its teachers in convocation to discuss the affairs of the university. Convocation will elect future chancellors and a certain number of representatives on the court. Like the Johns Hopkins University in the United States, the Victoria University has instituted certain fellowships (styled the Berkeley fellowships) for the encouragement of original research.

SCOTCH UNIVERSITIES.—The universities of Scotland, mostly founded in the 15th century, approach much more nearly to the type of Germany and the Low Countries than of England. The teaching as well as governing body were the professors, and the *college* was a building for the accommodation not of the students or fellows, but of the professors, as public lecturers. Though nearly all the students were Scotchmen, they were nevertheless divided, according to continental usage into four nations, named from the parts of Scotland to which they belonged. In St. Andrew's, there were from the first the separate faculties of divinity, arts, and canon law. A *pædagogium* was erected in 1430 for the Faculty of Arts. In 1450, Kennedy, Bishop of St. Andrew's, established and endowed the College of St. Salvator, to which Pope Paul II. accorded the privilege of conferring degrees in theology and the arts, constituting it to that effect a separate university. St. Leonard's College was founded in 1512, and St. Mary's in 1537, with power of conferring degrees. After the Reformation, St. Mary's was restricted to the study of theology; and in 1747, St. Salvator and St. Leonard were united. Glasgow had its lecturers in canon and civil law and theology from the beginning. The Faculty of Arts, however, alone received a definite shape and constitution; it had, as at St. Andrew's, a *pædagogium*, and, prior to the Reformation, had nearly absorbed the university. During the Reformation period, Glasgow University was nearly annihilated; but it was restored by the exertions of Queen Mary and James VI. The University of Aberdeen, as now constituted, derives its origin from two different foundations—one, the university and King's College at Aberdeen, founded in 1494 by William Elphinstone, bishop of Aberdeen, under the authority of a papal bull obtained at the instance of King James IV.; the other, Marischal College and University of Aberdeen, founded in 1593 by George Keith, Earl Marischal, by a charter ratified by act of parliament. By the universities (Scotland) act of 1859, King's and Marischal Colleges were incorporated into one university and college, as the University of Aberdeen—King's College being reserved for the faculties of arts and divinity, and Marischal College for law and medicine. The University of Edinburgh, founded after the Reformation, had but little of the ancient university character, being a professorial seminary on a royal foundation, rather than a society of graduates or students. James VI.'s charter of foundation placed it in the hands of the magistrates of the city, who remained its patrons till 1858. Besides a large number of small bursaries, there are now a few more considerable scholarships at the Scotch universities; but the endowments of this kind are still inconsiderable compared with those of the universities of England.

The Scotch universities have been much modified in various respects by a statute passed in 1858. For some time previous there had been a growing conviction that they were not keeping pace with the intelligence of the country. The absence of sufficient preparation on the part of the students obliged the professors of languages and mathematics to discharge inefficiently the functions of schoolmasters rather than their proper duties. Scholarship had declined, and a Scottish degree in arts had fallen into disrepute. These evils were sought to be cured by establishing an entrance examination, by grafting a certain amount of the tutorial on the professorial element, and by raising the standard of examination for degrees, so as to make them objects of ambition. The act of 1858 placed the Scottish universities under the superintendence of a Board of Commissioners for the space of four years, who had power to carry the statutory provi-

sions into effect. A uniform constitution was given to all the universities, each of which has now three governing bodies, the *Senatus Academicus*, the University Court, and the General Council, the chief officers being the Chancellor, the Vice-Chancellor, and the Rector. The *Senatus Academicus*, composed of the principal and professors, superintends the teaching and discipline, and administers the property and revenues of the university, one-third being a quorum, and the deliberations being subject to the control of the University Court. The principal presides, and has both a deliberative and a casting vote. The University Court consists of the Rector, the Principal, and Assessors named by the Chancellor, Rector, General Council, and *Senatus Academicus* (in Edinburgh, the Lord Provost and an Assessor elected by the town-council are also members of the court). The Rector, and the Assessor nominated by him, continue in office for three years; the other assessors for four years. The functions of this body include the reviewing of the decisions of the *Senatus*, the regulation of the internal arrangements of the university, in conjunction with the *Senatus*, the Chancellor, and the University Court, and the exercise of patronage to the chairs whose patronage was formerly in the *Senatus*. The General Council consists of the Chancellor, the members of the University Court, the professors, masters of arts, doctors of medicine who have attended four sessions, and all persons who, prior to August, 1861, produced evidence of attendance for four complete sessions, two of them being in the Faculty of Arts. The Council meets twice a year, the Chancellor, whom failing, the Rector or Principal, or senior professor present, presiding with a deliberative and casting vote. The duties of the Council are not legislative, but only deliberative; it may entertain any question affecting the university, and make representations regarding them to the University Court. The Chancellor is elected by the General Council, and holds office for life; he appoints a Vice-Chancellor, who may act for him in conferring degrees, which is his principal function. The Rector is elected by the matriculated students, and holds office for three years. At Edinburgh the patronage of those chairs which were in the gift of the town-council has been transferred to seven curators, three of them nominated by the University Court, and four by the town-council. Entrance examinations have been instituted in all the universities, and assistants appointed to several of the professors, with functions somewhat analogous to those of tutors in England.

The degrees now conferred in the Scotch universities are Master of Arts, Bachelor of Divinity, Bachelor of Laws, Bachelor of Medicine, Master in Surgery, and Doctor of Medicine; besides Doctor of Divinity and Doctor of Laws, which are purely honorary. Edinburgh grants, in addition, the degrees of Bachelor of Science and Doctor of Science, and Glasgow that of Bachelor of Science. The degree of Bachelor of Arts is not now given in any of the universities of Scotland.

IRISH UNIVERSITIES, *Dublin*.—Trinity College, Dublin, was founded in 1591, under the auspices of Sir John Perrot, the Irish viceroy. A royal charter nominated a Provost and a minimum number of three fellows and three scholars as a body corporate, empowered to establish among themselves "whatever laws of either of the universities of Cambridge or Oxford they may judge to be apt and suitable; and especially that no other persons should teach or profess the liberal arts in Ireland without the Queen's special license." The first five provosts of Trinity College were all Cambridge men, and under the influence of Archbishop Loftus, the first provost, and his successors, the foundation received a strongly Puritan bias. Prior to the year 1873 the provostship, fellowships, and foundation scholarships could be held only by members of the Church of Ireland; but all such restrictions were abolished by Act 35, Vict. c. 21, whereby the requirement of subscription to any article or formulary of faith was finally abrogated. As at present constituted, the ordinary government is in the hands of the provost and senior fellows in conjunction with the Visitors and Council, the supreme authority being the Crown, except so far as limited by Act of Parliament. See DUBLIN, UNIVERSITY OF.

Queen's.—The first departure in Ireland from the exclusive system of education formerly represented by the foundation at Dublin, dates from the creation of Queen's University, incorporated by royal charter, September 3d, 1850. By this charter, the general legislation of the university, together with its government and administration, was vested in the University Senate. In 1864 the charter of 1850 was superseded by a supplementary charter, and the university reconstituted "in order to render more complete and satisfactory the courses of education to be followed by students in the colleges;" and finally, in 1880, by virtue of the Act of Parliament known as the University Education (Ireland) Act of 1879, the Queen's University gave place to the Royal University of Ireland, which was practically a reconstitution of the former foundation, the dissolution of the Queen's University being decreed so soon as the newly constituted body should be in a position to confer degrees; at the same time all graduates of the Queen's University were recognized as graduates of the new university, with corresponding degrees, and all matriculated students of the former as entitled to the same status in the latter. The university confers degrees in arts (B.A., M.A., D. Litt.), science, engineering, music, medicine, surgery, obstetrics, and law. The preliminary pass-examinations in arts are held at annually selected centres—those chosen in 1885 being Dublin, Belfast, Carlow, Cork, Galway, Limerick, and Londonderry. All honor examinations, and all examinations in other faculties, are held in Dublin. The Queen's

Colleges at Belfast, Cork, and Galway were founded in December, 1845, under an Act of Parliament "to enable Her Majesty to endow new colleges for the advancement of learning in Ireland," and were subsequently incorporated as colleges of the university. Their professors were at the same time constituted professors in the university, and conducted the examinations. But in the reconstruction of 1880, the chief share in the conduct of the examinations, and advising the Senate with respect to them, was vested in a Board of Fellows, elected by the Senate in equal numbers from the non-denominational colleges and the purely Catholic institutions. The colleges retain, however, their independence, being in no way subject to the control of the University Senate, except in the regulations with respect to the requirements for degrees and other academic distinctions. On the other hand, the obligation formerly imposed of a preliminary course of study at one or other of the colleges, before admission to degrees, was abolished at the foundation of the Royal University, the examinations being now open, like those of the University of London, to all matriculated students on payment of certain fees.

WALES.—There is at present no University of Wales, although the bestowal of a royal charter before long is confidently anticipated. The oldest college, that of St. David's at Lampeter, possesses the right of conferring degrees. It was founded in 1822 for the purpose of educating clergymen in the principles of the Established Church of England and Wales, mainly for the supply of the Welsh dioceses. The next college in order of foundation is Aberystwith. It was founded October 6th, 1872, but possesses no charter, and is mainly supported by the dissenting bodies. The University College of South Wales and Monmouthshire at Cardiff was founded in 1883. The University College of North Wales at Bangor received its charter, June 4th, 1885, its object being to "provide instruction in all the branches of a liberal education except theology." There is a hall of residence for women students. At each of these three last-named colleges, students proceeding to degrees have to go through either a London, Edinburgh, Glasgow, or Dublin course of study; but at Edinburgh, Glasgow, and Dublin, a certain proportion of the term of residence ordinarily required is remitted in their favor.

General Statistics.—The following table gives the statistics of the British universities for the year 1890-91:

| | No. of Col- leges. | Teaching Staff. | Students. | | No. of Col- leges. | Teaching Staff. | Students. |
|---------------------------|--------------------------|--------------------|-----------|--------------------------------|--------------------------|--------------------|-----------|
| ENGLAND AND WALES. | | | | SCOTLAND. | | | |
| <i>Universities:*</i> | | | | <i>Universities:</i> | | | |
| Oxford..... | 23 | 84 | 3,145 | Aberdeen \|\|..... | 1 | 35 | 909 |
| Cambridge..... | 19 | 150 | 3,020 | Edinburgh..... | 1 | 103 | 3,576 |
| Durham..... | 1 | 13 | 225 | Glasgow \|\|..... | 1 | 61 | 2,165 |
| <i>Colleges:</i> | | | | St. Andrews..... | 2 | 16 | 208 |
| Aberystwith..... | 1 | 16 | 132 | <i>College:</i> | | | |
| Bangor..... | 1 | 15 | 94 | University, | | | |
| Birmingham..... | 1 | 21 | 429+ | Dundee..... | 1 | 19 | 307¶¶ |
| Bristol..... | 1 | 19 | 213+ | IRELAND. | | | |
| Cardiff..... | 1 | 20 | 150§ | <i>University:</i> | | | |
| Lampeter..... | 1 | 8 | 132 | Dublin..... | 1*** | 74 | 1,196 |
| Leeds..... | 1 | 53 | 460\|\| | <i>Colleges:</i> | | | |
| Liverpool..... | 1 | 38 | 301 | Queen's, Belfast..... | 1 | 18 | 461 |
| London: | | | | " Cork..... | 1 | 19 | 238 |
| University..... | 1 | 110 | 1,200 | " Galway..... | 1 | 16 | 122 |
| King's..... | 1 | 177 | 752¶ | Total United King- dom..... | 68 | 1,253 | 23,648 |
| Manchester..... | 1 | 83 | 815** | | | | |
| Newcastle..... | 2 | 34++ | 1,372++ | | | | |
| Nottingham..... | 1 | 40 | 1,805+++ | | | | |
| Sheffield..... | 1 | 11 | 221§§ | | | | |

* Owens College, Manchester, University College, Liverpool, and Yorkshire College, Leeds, are associated together as the Victoria University. +In addition there are 391 evening students. †In addition there are 245 evening students. § There are also 300 evening students. || Excluding 513 evening students. ¶ Of whom 409 are matriculated students; there are 1677 evening students. ** In addition there were 72 women and 439 evening students. ++ Including 19 professors and 163 students at College of Medicine. ++ Including day and evening students. §§ 71 day and 150 evening students, not including the popular lectures. || For 1889. ¶¶ Including 139 evening students. *** Trinity College.

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ITALIAN UNIVERSITIES.—In Italy, at a very early period of the Middle Ages, it was decided that the formal scholastic disputes were useless, and that their effects were pernicious. It was resolved, accordingly, to expel logic, and allow its place to be filled by rhetoric. It was by virtue of this decision, which was of a tacit rather than a formal character, that the expounders of the new learning in the fifteenth century, men like Em-

manuel Chrysoloras, Guarino, Leonardo Bruni, Bessarion, Argyropulus, and Valla, carried into effect that important revolution in academic studies which constituted a new era in university learning, and largely helped to pave the way for the Reformation. This discouragement of the controversial spirit, continued as it was in relation to theological questions after the Reformation, obtained for the Italian universities a fortunate immunity from dissensions like those which, as we shall shortly see, distracted the centres of learning in Germany. The professorial body also attained to an almost unrivaled reputation. It was exceptionally select, only those who were in receipt of salaries being permitted, as a rule, to lecture; it was also famed for its ability, the institution of concurrent chairs proving an excellent stimulus. These chairs were of two kinds—"ordinary" and "extraordinary"—the former being the more liberally endowed and fewer in number. For each subject of importance there were thus always two and sometimes three rival chairs, and a powerful and continuous emulation was thus maintained among the teachers. "From the integrity of their patrons, and the lofty standard by which they were judged," says Sir William Hamilton, "the call to a Paduan or Pisan chair was deemed the highest of all literary honors. The status of professor was in Italy elevated to a dignity which in other countries it has never reached; and not a few of the most illustrious teachers in the Italian seminaries were of the proudest nobility of the land. While the universities of other countries had fallen from Christian and cosmopolite to sectarian and local schools, it is the peculiar glory of the Italian that, under the enlightened liberality of their patrons, they still continued to assert their European universality. Creed and country were in them no bar—the latter not even a reason of preference. Foreigners of every nation are to be found among their professors; and the most learned man in Scotland (Dempster) sought in a Pisan chair that theatre for his abilities which he could not find at home."

In modern Italy the universities are numerically much in excess of the requirements of the population, there being no less than seventeen state universities and four free universities. Very few of these possess theological faculties, and in no country are theological studies less valued. Education for the church is almost entirely given at the numerous seminaries, where it is of an almost entirely elementary character. In 1875 an effort was made by Bonghi, the minister of education, to introduce reforms and to assimilate the universities in their organization and methods to the German type. His plans were, however, to a great extent reversed by his successor, Coppino.

The following is a list of the twenty-one universities of Italy, with statistics for 1888 :

| | Date of Foun- dation. | No. of Teachers. | Students and Auditors. | | Date of Foun- dation. | No. of Teachers. | Students and Auditors. |
|----------------------|-----------------------------|---------------------|------------------------------|---------------------|-----------------------------|---------------------|------------------------------|
| State Universities : | | | | Pisa..... | 1338 | 56 | 633 |
| Bologna..... | 1200 | 90 | 1,263 | Rome..... | 1303 | 84 | 1,356 |
| Cagliari..... | 1626 | 35 | 137 | Sassari..... | 1677 | 23 | 120 |
| Catania..... | 1434 | 43 | 459 | Siena..... | 1300 | 29 | 170 |
| Genoa..... | 1243 | 56 | 818 | Turin..... | 1404 | 72 | 2,233 |
| Macerata..... | 1290 | 13 | 105 | Free Universities : | | | |
| Messina..... | 1549 | 48 | 209 | Camerino..... | 1727 | 18 | 97 |
| Modena..... | 1678 | 37 | 321 | Ferrara..... | 1391 | 21 | 49 |
| Naples..... | 1224 | 91 | 4,104 | Perugia..... | 1276 | 21 | 130 |
| Padua..... | 1222 | 73 | 1,168 | Urbino..... | 1564 | 21 | 95 |
| Palermo..... | 1805 | 67 | 1,153 | Total | | | |
| Parma..... | 1512 | 42 | 238 | | | 994 | 15,911 |
| Pavia..... | 1300 | 54 | 1,063 | | | | |

GERMAN UNIVERSITIES. History.—The earliest known foundation of a German university dates from the years 1347 and 1348. In the former year Pope Clement VI. issued a bull authorizing and directing the establishment of a *studium generale* at Prague, which should possess the four faculties of theology, law, medicine and arts, and of which the Archbishop of Prague should be the chancellor. Charles, King of Bohemia, issued a charter for the new university in 1348, and, as Emperor Charles IV., confirmed it in the following year.

The most famous universities already existing were those at Bologna and Paris. Of widely different type, they had come into being in very different ways. The former was governed by the foreign students, who alone elected the rector, and upon whom the professors and masters were dependent. It had grown up independently of papal or imperial authority, until, in 1158, Frederick Barbarossa granted it extensive privileges. The University of Paris, on the other hand, belonged to the class known as "Chancellor-Universities," as being practically subject to the authority of the chancellor of the diocese, or at least licensed by him; the *magistri* and *scholares* of Paris were united into a corporation early in the 13th century. The internal control of the university devolved entirely upon the active teachers. A prominent feature of Italian and French universities alike was the division of the students into *nations*, generally four, each comprising students from several neighboring countries more closely united by ties of blood and language.

It was the University of Paris that was chosen as the model for Prague, and for every German university subsequently founded, until the time of the Reformation. In many charters it is expressly mentioned as the pattern after which the new institution is to be constructed. The list of these universities is as follows: Vienna, 1365, Heidelberg, 1386, Cologne, 1388, Erfurt, 1393, Leipsic, 1409, Rostock, 1419, Greifswald, 1456, Freiburg, 1457, Basle, 1460, Ingolstadt, 1472, Mayence, 1477, Tübingen, 1477, Wittenberg, 1502, Frankfort-on-the-Oder, 1506.

The prince who wished to establish a *studium generale* within his dominions applied to the Pope for a charter. The bulls granting such petitions closely resemble each other, indeed, are generally identical in substance. In many cases application was also made to the German Emperor, as the civil power to whom all were subject; still, the imperial confirmation does not seem to have been felt as a necessity until the time of Maximilian I., there being several universities for which no imperial sanction can be found to have been given (Vienna, Heidelberg, Leipsic, and others). This emperor, however, at the Diet of Worms in 1495, proposed that a university should be established in the dominions of each Elector of the Empire; and from that time until the extinction of the Holy Roman Empire, the emperors reserved for themselves the right of conceding permission to found a university. On the other hand it is very doubtful whether a papal bull was still considered essential. The foundation of Wittenberg and that of Frankfort were by grant of the emperor, followed up by a papal bull. Naturally for the Protestant foundations the protection of a bull was not sought.*

Of the universities in the period preceding the Reformation it has been well said by Tholuck that the promotion of learning accomplished by them consisted more in diffusing the knowledge already gained at the time of their foundation than in the increase of knowledge, more in progress along lines already marked out than in the opening up of new paths; and that down to the time of the Reformation they are completely mastered by the inertia of tradition. "Hardly any other corporations were able to offer such a tenacious resistance to the influences of the altering spirit of the times as the universities. Nevertheless it may be affirmed that after the Reformation the universities exhibit themselves to us in an essentially different phase, which, however, is not clearly discernible until the foundation of the University of Göttingen in the 18th century; within institutions originally quite ecclesiastical in character, secular interests begin to rival ecclesiastical interests, until finally the latter are subordinated to the former."[†]

The division into *four nations* was adopted in the older universities at their foundation, but hardly at all in those established later than Leipsic. At Leipsic the "nations" were retained as a mere form until 1830; elsewhere the long antiquated division had been abandoned much earlier. The very foundation of the University at Leipsic was due to bitter dissensions between German and Slav students at Prague, resulting in the secession of 5000 German students and teachers. Similarly in 1582 the jealousies and quarrels between Germans and Bohemians at Prague culminated in the separation of the university into two—a Bohemian and a German university.

The division into *four faculties* was everywhere adopted, and has maintained itself to this day. At Paris the rector had to be chosen from the Faculty of Arts, which was at first the case at some German universities, while at others, as Tübingen, this faculty occupied a subordinate position. The studies in the Faculty of Arts consisted of the *Trivium*: grammar, rhetoric, dialectics; and the *Quadrivium*: arithmetic, music, geometry, astronomy (and astrology). The works of Aristotle, in Latin translations, formed the chief basis of instruction in the *Trivium*, as far as they covered the ground; for the *Quadrivium* numerous text-books were prescribed. The use of Latin was obligatory, even for informal intercourse, in all the faculties. In the Theological Faculty the prescribed subjects were but two: the Holy Scriptures and the *Sentences* of Petrus Lombardus. The Faculty of Law, though comprising the two independent studies of Canon Law and Civil Law, was regarded as a unit. In the Faculty of Medicine the works prescribed were chiefly those of Joannicius, Avicenna, Rasis, Almansor, Hippocrates, Galen. The degrees conferred were those of bachelor, licentiate, and master or doctor, the latter terms being considered equivalent, except that during most of the 15th century the title of doctor was used chiefly in the faculties of law and medicine, that of master in the others. The time necessary to the attainment of these degrees varied in the different faculties.

The University of Wittenberg rapidly attained a commanding position. Cologne was at this time a stronghold of the moribund scholasticism, and especially ultramontane in character, while the Classicists rallied chiefly at Heidelberg and Tübingen. For men of the stamp of Agricola, Reuchlin, and Melanchthon, the study of the Greek and Roman classics formed but a stepping-stone to the investigation of the Holy Scriptures in the original Hebrew and Greek. At Wittenberg, where the principles of the Reformation

* Yet in 1544, when the creation of a university at Königsberg was contemplated, the Margrave Albert, after granting a charter wholly Protestant in character, applied to the Vatican for the right of granting degrees. The issuing of the bull was made dependent upon the procurement of the imperial sanction, but as this was never given, the bull was not issued; and in 1556 the King of Poland, on Albert's application, gave his sanction to the university, conferring upon it all the usual rights and privileges.

† Tholuck in Herzog's *Realencyclopädie für protestantische Theologie und Kirche*, vol. XVI, p. 723-4

were adopted from the first, lectures were given upon the original text of the Old and the New Testaments: the *Loci* of Melancthon supplanted the *Sentences* of Lombardus. Aristotle was read in the original, and rhetoric, under Melancthon's influence, advanced to a position of equality with dialectics, and finally superseded it. The changes in the study of "grammar" were not less important: the Greek and Latin classics, which hitherto had been almost entirely neglected, being now advanced to a position of great prominence. Wittenberg became the model for the Protestant universities subsequently founded. The majority of the older universities became Protestant; to the Lutheran confession were joined Erfurt in 1525, Rostock in 1531, Tübingen in 1535, Leipsic in 1539, Greifswald in 1545. Heidelberg attached herself to the German Reformed Church in 1559, but suffered afterwards many changes of religious complexion, even having at times Roman Catholic professors imposed upon her; Frankfort joined the Reformed Church in 1591. The first Protestant university to be established after the Reformation was Marburg, in 1527; it was intended to be a stronghold of Lutheranism, but became Calvinistic in 1607. The others of Lutheran tendencies, established in the 16th century, were Königsberg (1544), Jena (1558), Helmstädt (1576), Altdorf (1578). The University of Dillingen, founded in 1549 by Otto von Truchsess, Bishop of Augsburg, became, after 1564, in the hands of the Jesuits, one of the strongest defenses against the advance of Protestantism; the other Catholic foundations of this century were Olmütz (1581), Würzburg (1582), and Gratz (1586).

During the 17th century no fewer than thirteen universities were founded in German-speaking countries, but only six* of these attained any great prominence, and only five still survive. The Protestant foundations were Giessen (1607), Rinteln (1621), Strassburg (1621), Dorpat (1632), Herborn (1654), Duisburg (1656), Kiel (1665), Halle (1694)—all Lutheran, except Duisburg, which was a foundation of the German Reformed Church. The Catholic establishments were Paderborn (1615—suppressed in 1625), Salsburg (1623), Osnabrück (1630—suppressed three years later), Bamberg (1648), and Innsbruck (1672). The Catholic reaction and counter-reformation of this century exerted a marked influence upon the ancient universities which had remained Catholic, and which were now reorganized and rejuvenated; and the Jesuits gained almost complete control.

The demoralizing effect of the Thirty Years' War upon the universities of Germany was extremely great; while other elements conspired to work equal harm to them from the inside. In none of the universities of Europe were the students, as a whole, noted for decency of life; the accounts of Jacques de Vitry and others, and the statutes of the universities, show in a very strong light the profligacy, of masters and students alike, which prevailed during the thirteenth and following centuries. Throughout the 16th and 17th centuries there existed in the German universities a curious custom known as *Deposition* or *Beania*, a sort of initiation with wildly grotesque and often degrading ceremonies, which, however, received official sanction, and was even prescribed by the authorities for entering students. It was abolished at Tübingen only in 1717, at Wittenberg not until 1733, though the statutes of Halle in 1694 expressly prohibited it. At the beginning of the 17th century, or about 1610, there suddenly appeared in the majority of the German universities a strange phenomenon known as *Pennalism* (q. v.), an extremely brutal parody of the ceremonies of *Deposition*, which soon became an organized conspiracy among the older students for the maltreatment of the younger. The excesses of the *Pennales* became so great that the authorities were forced to make a determined stand against the shameful practice, but it was not completely stamped out until after 1660.†

A turning-point in the history of the German universities is marked by the foundation of the University of Halle in 1693-4. It was established in the expressed interest of Lutheranism, as Frankfort had come into the hands of the Reformed Church, but the new university soon outgrew the bounds originally set for it, especially under the influence of the famous Thomasius and Francke. Thomasius was the first to abandon the use of Latin in the lecture-room, an example soon followed to a greater or less extent throughout Germany. In 1702 was founded the University of Breslau, at the instance of the Jesuits, yet without papal sanction. In 1737 the University of Göttingen was opened, planned on lines even more liberal than those of Halle; the excellence of its library, the great attention now for the first time paid to the study of history, and the enlightened efforts of Münchhausen in its behalf, during his curatorship of 32 years, were all powerful factors in the rapid growth of the new university. Göttingen and Halle may truly be said to have dominated the intellectual life of Germany during the 18th century. The Lutheran University of Erlangen was opened in 1743.

The thirty years from 1790 to 1820 witnessed great changes in the German universities. No fewer than nine—Mayence, Cologne, Bamberg, Dillingen, Duisburg, Rinteln, Helmstädt, Salzburg, and Erfurt—were suppressed; Altdorf was fused with Erlangen in 1809, Frankfort with Breslau in 1809, Wittenberg with Halle in 1815. The university at Ingolstadt was transferred to Landshut in 1802, and thence to Munich in 1826. Only

* Giessen, Bamberg, Dorpat, Kiel, Innsbruck, Halle.

† The term *Pennaler* survives in Germany as a half-contemptuous name applied to boys still at the gymnasium.

the University of Mayence had retained any importance, and the changes were of great benefit to the cause of higher education in Germany.

The necessity of a reformation of the Prussian universities, in the direction of still greater liberality of thought and teaching than was represented at Halle and Königsberg, had already been recognized by Frederick William III. and his ministers as early as 1800. After the Peace of Tilsit had left Prussia in a greatly humbled condition, one of the first means devised by the ministers, notably by W. von Humboldt, for the regeneration of the fallen state, was the establishment of a university at Berlin. The plans were drawn with singular foresight; to the newly chosen professors complete liberty was granted, that the university might not seem committed to any one school of thought. The result soon justified this course. The favorable situation in the capital and the eminence of the lecturers combined to render the growth of the new institution, which was opened in 1809, not less than phenomenal. In 1813 the teachers numbered 55; in 1891, 335. The list of rectors and deans reads like a muster-roll of scholarly fame; Fichte, von Savigny, Schleiermacher, Hufeland, Reil, Boeckh, Neander, von Raumer, Hegel, Bopp, Osann, Lachmann, Zumpt, Dieterici, Ranke, Trendelenburg, Puchta, Weiss, Nitzsch, Dove, Haupt, Mommsen, Curtius: these are some of the names there recorded.

The other entirely new foundation of this century in Germany is Bonn, opened in 1818, which has rapidly gained eminence, especially as a school of philosophy and philology, ranking in 1890 as sixth in size among the universities of the German Empire. The University of Munich, starting in 1826 with the union of the university transferred from Landshut with the Royal Academy of Sciences, has for many years ranked as second or third in size, surpassed only by Berlin and Vienna, and occasionally by Leipzig. In 1872 the University of Strassburg, lost to Germany in 1681 and suppressed at the time of the French Revolution as dangerously German in character and tendency, was reopened, and great pains were bestowed upon its equipment. Its rank in size was eleventh in 1890-91. In 1875 the University of Czernowitz, in the Bukovina, was opened, the theological faculty of which belongs to the Orthodox Greek Church, though the language of the university is German. In 1889 the Roman Catholic University of Freiburg in Switzerland was opened, in which lectures are given in French and German. In 1890 the Academy at Lausanne, which had existed as such since 1537, was changed into a university by the addition of a medical faculty; the elevation to university rank was celebrated with great splendor in May, 1891.

The influence of Berlin upon the other Prussian universities, indeed upon all the others of Germany, has been very great. The present century has witnessed the establishment in the German universities of professorships in almost every branch of learning, and the discarding of many antiquated and useless features still tolerated in other lands; it has seen the completion of their transformation from chiefly ecclesiastical into thoroughly secular institutions, bound, except for the theological faculties, to no particular form of religion, to no particular scientific doctrine, and unrestricted in their freedom of research and teaching. But the Germans do not intend that their universities shall fail to share further in the general advancement of the age; they are keenly conscious that the true and lasting strength of a university lies in its teachers, not in its beautiful buildings or luxurious life; they look to the universities to lead the van of scientific progress; and propositions for the reform of still existing abuses are eagerly proposed, and discussed with a vigor characteristic of the important position which the universities hold in the estimation of the intelligent public.

General Account.—The universities of the countries comprising the German Empire are strictly state institutions, subject directly to the "Minister of Ecclesiastical, Educational, and Medical Affairs" of the state in which each is situated; only the university of Strassburg is subject to the imperial Minister of Education. Of the same essential character with them are the universities of Austria and Switzerland, in which German is the official language; in Austria these are Czernowitz, Gratz, Innsbruck, Prague, Vienna; in Switzerland, Basle, Bern, Zürich. The Austrian universities of Cracow and Lemberg, whose official language is Polish, and the Swiss universities of Freiburg (Fribourg), Geneva, Lausanne (with the institution at Neuchatel, called academy, because lacking the faculty of medicine), at which French is used prevalently or entirely, are also modeled on the German plan. The university at Dorpat, in the Russian province of Livonia, is similarly constituted, and though viewed with a jealous eye by the Russian authorities, has thus far resisted more or less successfully the attempts at its Russification.*

Complete parity exists among the universities of the German Empire, and, to a lesser degree, between them and the German-speaking universities of Austria and Switzerland. Courses of lectures count as much at any other university as at the one where they are taken; a student once entered at one university is thereby entitled to enter any other without the formality of proving himself "mature" (see below); and the cost of matriculation is considerably smaller when the applicant comes from another university.

* A decree issued in May, 1887, prescribed the use of Russian as the language of instruction throughout the Baltic Provinces, but in the summer of 1891 out of over 160 courses of lectures only 21 were advertised to be read in Russian.

In Germany the term "university" is applied with great strictness,* only those institutions which are provided with at least the four faculties of theology, law, medicine, and philosophy being entitled to be thus designated. Consequently the Lyceum Hosianum at Braunsberg, in the province of East Prussia, and the Academy at Münster in Westphalia, each of which comprises only the faculties of Roman Catholic theology and of philosophy, are never designated as universities.

Most of the German and Austrian universities are designated in official communications by names originally given in honor of sovereigns by whom they were founded; thus the university at Berlin is styled the "Königliche Friedrich-Wilhelms-Universität" that at Heidelberg the "Ruprecht-Carls-Universität," but ordinarily they are called "Die Universität Berlin," "Die Universität Heidelberg," etc. But the universities at Breslau, Greifswald, Leipsic, Marburg, and Rostock, and the Swiss universities, bear the simple designations "Universität Breslau," etc.

The universities at present existing in the German Empire, and the German universities of Austria, Switzerland, and Russia, with the year of their establishment, are as follows:

A. GERMAN EMPIRE

Prussia:

Berlin, 1809.
Bonn, 1818.
[Braunsberg, 1568, 1818.]
Breslau, 1702.
Göttingen, 1737.
Greifswald, 1456.
Halle, 1694.
Kiel, 1665.
Königsberg, 1544.
Marburg, 1527
[Münster, 1786.]

Bavaria:

Erlangen, 1743.
Munich, 1826.
Würzburg, 1582.

Baden:

Freiburg, 1457.
Heidelberg, 1386.

Kingdom of Saxony:

Leipsic, 1409.

Saxon Duchies:

Jena, 1558.

Württemberg:

Tübingen, 1477.

Hessen:

Giessen, 1607.

Mecklenburg-Schwerin:

Rostock, 1419.

Reichslande:

Strassburg, 1621, 1872.

B. AUSTRIA.

Czernowitz, 1875.
Graz, 1586.
Innsbruck, 1672.
Prague, 1348.
Vienna, 1365.

C. SWITZERLAND.

Basle, 1460.
Berne, 1834.
Zürich, 1832.

D. RUSSIA, BALTIC PROVINCES.

Dorpat, 1632, 1802.

The purpose of the German university is twofold: First, to afford the theoretical part of that special training which is in Germany a prerequisite for admission to the professions of the Church, the Bar, Medicine, Forestry, the higher Civil Service, Pharmacy, and the profession of teaching in the universities or the higher schools (*Gymnasien, Progymnasien, Realschulen, höhere Bürgerschulen*); and, secondly, to equip its students in the most thorough manner possible for the work of independent scientific research. In brief, such a university is at one and the same time a group of professional schools and an association for the advancement of science in all its branches.† The strictly technical professions of civil and mining engineering, applied chemistry, architecture, etc., are assigned entirely to the Polytechnic and Mining Schools. The subject of forestry is in Bavaria, Württemberg, and Hessen taught at the universities; in Prussia it is not under the control of the Minister of Education, but assigned to the Department of Finance, and separate Academies of Forestry are maintained. The scientific teaching of agriculture is provided for partly by independent academies, as at Poppelsdorf (near Bonn), partly by institutions called *Landwirthschaftliche Hochschulen*, as at Berlin, and partly by special departments at the universities, as at Leipsic, Göttingen, and other places.

The German universities do *not* aim at giving simply a good general education, or at exerting a definite moral or religious influence upon those who attend them; that is the work of the schools, candidates for entrance to the university being supposed to be *maturi*. For this reason a German university does not offer definitely arranged courses, to be taken in a prescribed order, and in a prescribed number of years, as in the schools

* Another name sometimes used is *Hochschule*.

† "If we ask more particularly what they (i.e., English and French observers) find to praise in our conditions, what moment appears to them to be the foundation of the excellence of our universities, their unanimous answer is: 'The constant union and amalgamation of research and instruction.'" Von Sybel, *Die deutschen Universitäten*, p. 11.

and in American colleges. It assumes no responsibility for the performances of the individual student, for his success in obtaining a degree; it simply says to its frequenters: "Here are all the helps to a thorough training which we can afford you; you may make use of them or not. We shall give you, however, no certificate of proficiency for work done in a perfunctory manner, nor any degree on a mere passing of examinations." The students do not receive names indicating the length of their stay at the university, nor are they graduated in classes. As Matthew Arnold puts it (*Higher Schools and Universities in Germany*, p. 152): "*Lehrfreiheit* and *Lernfreiheit*, liberty for the teacher and liberty for the learner; and *Wissenschaft*, science, knowledge, systematically pursued and prized in and for itself, are the fundamental ideas of that system."

Though the universities are subject to the Ministers of Education of their respective states, each enjoys a high degree of autonomy, and of each the constitution is essentially republican. Few of them have any great resources of their own; what they have consists partly of endowments, partly of lecture-fees and other fees paid by the students, the balance of the expenses of management being paid by the state. There are no "trustees" or "overseers," their place being taken by the Minister of Education; no permanent presidents, and no system of "departments," wherein one professor has other instructors dependent on him.

The internal administration of each university is in the hands of a Rector, a Dean for each faculty, the *Senatus Academicus*, and the *Quæstor*. The Rector and Deans are chosen annually by the full professors, from among their own number. In some universities the title of Rector is borne by the sovereign (so at Heidelberg the Grand Duke of Baden is the titular Rector), when the *de facto* Rector, chosen annually, bears the title of "Pro-rector." In official documents the Rector is called *rector magnificus*, and the formal mode of addressing him is "Ihre Magnificenz;" at Leipsic the King of Saxony is *rector magnificentissimus*. At each university the government is represented by an official, called in Prussia Curator, at Tübingen Chancellor, at Leipsic Government Plenipotentiary, whose duty it is to watch over the observance of the laws and regulations concerning the universities.

The Rector is the visible head of the university; he has an *assessor* in the person of the *Universitätsrichter*, whose office is permanent, and whose co-operation is requisite where fines are to be inflicted, and in some other cases. The *Senatus Academicus* is in some universities composed of all the full professors, in others of delegates elected by them from their own number; the Rector is its president. It has jurisdiction over the conduct of the university, but the consent of the government is necessary when new regulations are proposed. The Deans stand in about the same relation to each faculty as that borne by the Rector to the whole university; in particular, the business of attending to applications for degrees, and of arranging for the examinations therefor, devolves upon them. The *Quæstor* is a sort of university treasurer; he receives from the students the fees for matriculation and ex-matriculation, and for the courses of lectures, and pays to the lecturers the proportion of lecture-fees due them. There are also several inferior officials called *Pedelle* (beadles), a sort of university police.

The discipline of the university over its students is maintained by means of the "University Court," composed exclusively of certain members of the faculty of law; a student accused of any serious misdemeanor is summoned before this body, where he may defend himself with the assistance of counsel. The punishments inflicted are as follows: reprimand, fine, imprisonment in the university *Carcer*, deprivation of the right to count the current academic year among the number prescribed for a degree, threat of removal from the university rolls, *consilium abeundi* (i.e., suspension for a fixed time, during which, however, the offender may enter another university), and, in extreme cases, "relegation," i.e., expulsion, which renders it practically impossible for the offender to enter any other German university, notice being sent to each and every one.

The term "faculty," as used in Germany, signifies (1) the teaching body, especially the full professors, and (2) the total of teachers and students in one of the great divisions of the university. A student as well as a professor thus belongs to this or that faculty. The traditional division of faculties is the fourfold one into the theological, the legal, the medical, and the philosophical. At every German university there is a faculty of either Protestant or Roman Catholic theology; Protestant faculties only are at Berlin, Erlangen, Giessen, Göttingen, Greifswald, Halle, Heidelberg, Jena, Kiel, Königsberg, Leipsic, Marburg, Rostock, Strassburg; Roman Catholic only are at Freiburg, Munich, Würzburg, at the Academy at Münster and the Lyceum at Braunsberg; while at Bonn, Breslau, and Tübingen there are *paritetic* faculties, i.e., one each of Roman Catholic and of Protestant theology. The philosophical faculty, in the majority of universities, comprises all the courses of lectures which do not belong in any one of the other three; but the extraordinary growth and ramification of physical, social, and philological science in the present century has made the philosophical faculty a very unwieldy body, so that in different universities, particularly in South Germany, different remedies have been sought. At Munich there are distinguished five: theology, law, political science (including forestry), medicine, and philosophy; at Strassburg five, the philosophical faculty having been divided into (a) philosophy and (b) mathematics and natural

science ; at Tübingen seven : Protestant and Roman Catholic theology, law, medicine, philosophy, political science (including forestry and agriculture), natural science ; at Würzburg the philosophical faculty is divided as at Strassburg, with, however, but one dean for the two sections. The other universities retain the philosophical faculty undivided.

The teaching body of a German university consists of (1) Full Professors (*ordinarii*, *ordentliche Professoren*), (2) Extraordinary Professors (*ausserordentliche*), and (3) *Privatdozenten*. To these are to be added (4) Readers (*Lectoren*), appointed to give practical instruction in modern languages ; there are also (5) Masters of dancing, fencing, riding, etc., whose connection with the university is often merely nominal.

The *full professors* are the occupants of chairs intended to be permanent foundations ; they alone sit in the *Senatus Academicus*, and are alone eligible to the rectorship and deanships. The *extraordinary professors* are either younger men, to whom the professorial title has been granted by the Government for distinguished work, or they represent subjects in which no permanent chairs have been established ; sometimes both conditions are exemplified in the same individual. On the other hand there are often to be found extraordinary professors of advanced age ; in such cases the Government may never have deemed it expedient to create full professorships in their respective branches, or may for particular reasons have been unwilling to advance the individual to a permanent place of honor, or the individual may have so far failed to fulfill the promise of his earlier years that no other university has been willing to extend him a call. Occasionally *honorary ordinary professors* are to be found ; this title is bestowed when the Government regards the extraordinary professor as entitled to a higher rank, but is not ready to create a full professorship for him. The *Privatdozenten* form an institution peculiar to German universities and to the universities modeled after them. They have no official connection with the university beyond the privilege of lecturing (*venia docendi* or *legendi*) and of receiving the lecture-fees ; in other words, they are not appointed, but permitted, to lecture. The *ordinarii* and *extraordinarii* receive a stated salary from the Government, the latter considerably less than the former, but there are no fixed salaries attaching to each position, the Government arranging with each individual separately. The *Privatdozenten*, in the great majority of cases, receive no salary at all ; of late years the practice has arisen of paying them a small stipend, but the advisability of this custom has been and still is violently debated in Germany. The two classes of professors, and the *Privatdozenten* as well, receive the fees paid by the students for their respective lectures, less a small percentage which goes into the university chest. The salaries vary greatly, the income from fees even more. An average salary for an *ordinarius* is perhaps 7000 to 9000 marks per annum (\$1750 to \$2250) ; for the principal positions of the medical and legal faculties of the largest universities the figures are much higher. The amounts received from lecture-fees vary, of course, with the number of students attending, and with the faculty, the fees being lowest in the theological faculty, and highest in the medical. In the philosophical faculty a course of four hours weekly throughout the semester costs on an average about \$4 ; in the medical faculty often as much as \$8 or \$9. Consequently a lecturer whose courses were attended by 300 students in each semester would in the former faculty receive about \$2400, in the latter about \$4800 or \$5000 annually in fees ; and there are a very few positions which the writer has heard estimated as worth \$15,000 per annum in salary and fees combined. The income of a *Privatdozent* from university sources is often ludicrously small.

It is important to remark that the extraordinary professors and *Privatdozenten* are in no sense subject to the authority of the full professors. The organization by "departments," so common in America, is unknown in German universities. Each professor receives his appointment, and each *Privatdozent* his *venia legendi*, for some branch of learning ;* the choice of subjects for his lectures in each semester, and the method of treatment, is his own privilege exclusively. This is the *Lehrfreiheit*, of which the Germans are justly so proud. As a matter of fact the different lecturers generally arrange their subjects so as to cover the whole field as well as possible, and so as to relieve each one of the drudgery of repeating the same course in successive semesters. There is, however, nothing to prevent a *Privatdozent* from announcing a course on a subject chosen for the same semester by an ordinary or extraordinary professor. This would, of course, be looked upon as extremely discourteous ; but it not infrequently happens that the same subject is treated, or nearly the same ground covered, by professor and *Privatdozent* respectively, in successive semesters, and often from very different points of view. The *Privatdozenten* play an extremely important part in the economy of a German university ; the Germans rightly look upon them as forming one of the strongest buttresses of their admirable system of higher education. They are in no sense *tutors*, least of all private tutors, their whole energy being devoted to research, and to the presentation of the results ; and they represent the coming generation of professors, cases being extremely rare where professors are chosen except from among the ranks of *Privatdozenten*. In this way they serve the extremely useful purpose of keeping the professors fully abreast of the times in scientific investigation, for with the

* It is interesting to note, for example, that appointments are not made for Latin or Greek exclusively, but for classical philology, or archeology, or comparative philology.

almost complete freedom allowed the students in the choice of lectures (the *Lernfreiheit*), these are extremely quick to detect any failure on the part of the lecturer to keep up with the advance of science, and are apt to desert him for the younger and more enterprising man, particularly as the courses given by all three classes of lecturers count as of equal value. Such a comparison of men and lectures is also rendered easier by the wide prevalence of the custom known as *hospitieren*, which is this: at the beginning of each semester a student in doubt as to what courses to select will attend a great number of different ones for a few days before subscribing his name to the lists which are sent around in the lecture-room.

With regard to the choice of professors, as in almost every other respect, complete reciprocity exists among the German universities. Calls from one university to another are much more frequent than promotions in the same university.* Of late years, however, the authorities of Bavaria and Württemberg have been accused—not always without reason—of undue preference shown for their own countrymen. In this respect Prussia has been most liberal. Appointments are made by the *Cultusminister*, except for the faculty of Protestant theology, for which the Consistory makes the appointments. When a full professorship becomes vacant, the *Senatus Academicus* recommends three names to the *Cultusminister*, who then makes the choice, though he is not bound to appoint one of the three. A vacant full professorship, or one newly created, is almost always filled by the choice of a full professor elsewhere, or an *extraordinarius* at home or elsewhere; very rarely the choice falls upon a *Privatdocent*, and still more rarely are men chosen from outside the universities. In making the choice regard is paid more to the scientific prominence of the candidates than to their skill as lecturers—a striking testimony to the importance attached by the Germans to the idea that the universities should lead the way in scientific investigation. The rank of *extraordinarius* is almost exclusively conferred upon *Privatdozenten* who have distinguished themselves; the extraordinary professors who have not been *Privatdozenten* are extremely few.†

The *Privatdozenten* become such by a process called *Habilitation*. A young man who has finished his university studies with distinction, and has received the doctor's degree (though this is not always requisite), undertakes some more extended and difficult investigation, the results of which, embodied in an essay or book, he hands in to the authorities of the university and of the faculty for which he seeks the *venia docendi*, along with a number of *theses*, propositions calculated to excite opposition, which he undertakes to defend in public. If his work is found satisfactory, he is invited to defend his theses before the Rector of the university and any one who wishes to attend. This having been successfully done, the desired *venia* is granted him. In most universities the public disputation is a mere form, but at Tübingen it is sometimes a very serious matter.‡ In the theological faculty the *venia docendi* is granted to those who pass the examination for *Licentiate*, the doctor's degree being rarely bestowed in this faculty except as an honorary degree, and then very sparingly.

A peculiar class of *Privatdozenten* is found in the medical faculties of the larger universities, notably of Berlin; medical practitioners, often of very mature age, obtain for themselves the *venia docendi* in some special branch of medicine, largely for the sake of increased practice, but without any intention of pursuing the academic career. In this way the number of *Privatdozenten* in the medical faculty at Berlin for the summer-semester of 1891 amounts to 62.

It is not uncommon for *Privatdozenten* to act simultaneously as teachers in the *Gymnasias*, especially when their own means are not sufficient to support them. This is sometimes the case with extraordinary, sometimes even with ordinary, professors. The *Privatdozenten* are not bound to deliver any lectures at all; but one who should fail to lecture during several semesters, unless with some valid excuse, would be likely to receive a request from the authorities to announce some lectures or to withdraw from the university.

The chief modes of instruction in the German universities are (1) by lecture, and (2) by the *Seminare*. There are two semesters or terms; in the majority of universities the winter semester extends officially from October 15th to March 15th, the summer semester from April 15th to Aug. 15th. In effect the semesters are sometimes considerably shorter, the lectures not beginning promptly, and terminating a week or more before the official close of the term. The winter semester, being a month longer, is regarded as the more important of the two.

1. Lectures are given *publice*, *privatim*, or *privatissime*. The lectures *publice* are delivered gratis, and in most universities each full professor is expected to deliver in each semester one such course of one or two hours weekly. The lectures *privatim* are the ordinary lectures; they are by far the most numerous, and for them the regular fees

* It is no uncommon thing for a professor to be attached to four or five universities in the course of his career.

† The most recent case that has come to the knowledge of the writer occurred at Heidelberg in the early part of 1890; and even then the appointee was about to become a *Privatdocent*, and had already made an honorable name for himself in Semitic languages.

‡ At a disputation of this sort attended by the writer at Tübingen in 1878, the argumentation was kept up for over three hours.

are charged. Any matriculated student, and any one who though unmatriculated has received especial permission to attend lectures, may take them on putting his name to the subscription list (*Belegbogen*). The lectures *privatissime* must be arranged for directly with the lecturer; they are for advanced students, and are sometimes given at the lecturer's rooms, but not infrequently are gratis. The lectures always begin about a quarter of an hour after the advertised time; this "academic quarter" has become a fixed custom. The students assemble a few moments beforehand; in the South German universities they rise at the entrance and departure of the lecturer. The nature of the lecture, of course, varies according to the subject treated, and even more with the personality of the lecturer. Where the subject is a new one to the students, as, for example, one of the Oriental languages, a text-book is often used, and the lecture assumes more the character of a recitation, but no student is held to the performance of prescribed tasks. Disorder in lecture-rooms is unheard of. The students have a curious custom of scraping their feet on the floor when they have not understood the lecturer, or when he "reads" beyond the proper time.

The number of lectures delivered weekly by each professor, of course, varies greatly. In the theological faculty at Berlin some lecturers offer courses amounting to twelve or fourteen hours per week; in the other faculties the average is lower, a German professor considering himself amply occupied with eight to ten hours weekly of lectures, or even less. In addition to this, however, he may have duties in connection with *Seminare*, with examinations, or in laboratories, and the like, which increase considerably the number of hours claimed by the university. It is very common for a lecturer to have five or six comprehensive courses of lectures on different branches of his subject, which he delivers in rotation, so that each course comes to be read about once in three years, the intervals being taken to bring the lectures closely up to date. Herein lies, according to German ideas, one of the chief advantages of the lecture-system; with the rapid advance of science in modern times, the best text-books often become antiquated in a very short time after their appearance; but the lecturer is able, and is supposed, to keep abreast of the very latest investigations in his line of work. The lists of lectures for each semester are made up about the middle of the preceding semester, and published in pamphlet form; they are also commonly advertised in several learned and other periodicals (such as the *Literarisches Centralblatt*, published at Leipsic). The *Deutscher Universitätskalender*, published semi-annually at Berlin, contains the lists of lectures for all the universities of Germany and Switzerland, the German-speaking universities of Austria, and Dorpat.

2. The *Seminare* partake more of the nature of classes. They are designed particularly for the better training of intending teachers. The number of students attending each as regular members is limited, generally, to twelve. Most of them are permanent foundations, royal, grand-ducal, or ducal, which pay a small annual stipend to their members, on the condition of satisfactory performance of their prescribed duties. Each *Seminar* has a director in the person of a professor, who usually varies with successive semesters. Admission is obtained, when vacancies occur, generally by competition, essays on stipulated subjects connected with the work of the *Seminar* being submitted by the candidates. The meetings are held at stated intervals, generally weekly, and may be attended, with the permission of the professor in charge, by others than the regular members. Sometimes *extraordinary members* are admitted, but these receive no stipend, nor have they the full duties or privileges of the regular members. A subject of discussion is assigned for each meeting; one of the members, previously designated, and called the *Referent*, reads an essay on the subject given out; another, the *Rezensent* or *Opponent*, designated at the same time with the *Referent*, criticises it, for which purpose the *Referent* is obliged to submit his essay to him a certain number of days before the meeting. After this a general discussion of the subject is held, the professor in charge acting as chairman. The amount of work required of the members of such a *Seminar* is very considerable; and the *Seminare* themselves are rightly regarded as forming an invaluable auxiliary to the work of instruction as otherwise carried on. There are sometimes also *Proseminare*, which give a preparation for the work of the *Seminare* proper. Other societies are formed on the model of the *Seminare*, sometimes by the professors, who then invite their most promising students to join them, sometimes among the students, different professors being in turn invited to attend and address the meetings. Some of the most valuable contributions to science have emanated from these societies; thus the well-known *Studien* edited by G. Curtius consist largely of essays read at the meetings of his *Grammatische Gesellschaft* at Leipsic.*

* The following is a list of the *Seminare*, etc., at Leipsic, in 1891:

a. Theological. 1. *Sem.* for Practical Theology. Homiletic and Liturgical Section: Director, Prof. Rietschel. Catechetical Section: Prof. Schnedermann. Paedagogical Section: Prof. Hofmann. 2. *Sem.* for Ecclesiastical History: Prof. Brieger.
b. Legal. *Seminar*: Professors Binding, Wach, Bülow.
c. Medical. 17 "Institutes," medical and surgical, clinics, etc.
d. Philosophical. 1. *Philological Seminar and Proseminar*: Professors Ribbeck, Lipsius, Wachsmuth. 2. *Archaeological Sem.*: Prof. Overbeck. 3. *Germanistic Sem.*: Prof. Zarncke. 4. *Philological Institutes*. i. *Classical Philology*: Prof. Wachsmuth; ii. *Germanistic Philology*: Prof. Zarncke. 5. *Institute for Experimental Psychology*: Prof. Wundt. 6. *Historical Sem.*: Prof. Maurenbrecher. 7. *Geographical Sem.*: Prof. Ratzel. 8. *Paedagogical Sem.*: Professors Masius and Richter. 9. *Sem.* for Political Science: Prof. Brentano. 10, 11. *Two Agricultural Institutes*: Professors Kirchner and Stohmann. 12. *Mathematical Sem.*: Professors Lie and Mayer.

For the natural sciences and the medical faculty museums, laboratories, operating theatres, etc., are provided in great completeness, and these generally form the only buildings of any architectural importance which a German university can boast. The attempt is rarely made to group together all the buildings belonging to one university, and even in a small university town they may be at a considerable distance apart, the laboratories, botanical gardens, hospitals, and the like, being naturally placed on the outskirts of the town, while the lecture rooms for the other faculties are commonly situated in the heart of the town. Only a few universities have very modern buildings for their theological, legal, and philological or strictly philosophical lectures, old palaces or monasteries being generally utilized for the purpose.

For a German subject, there is but one door to matriculation in the university: the graduating examination (*Abiturienten-Examen*) of the *Gymnasia*; but if he wishes to pursue certain courses in natural science, or in mathematics, the similar examination of the *Realschulen* may be substituted. (To pass these examinations it is not absolutely necessary that the candidate should have attended either *Gymnasium* or *Realschule*, but few attempt to pass them except after such attendance.) The universities never hold any entrance-examinations; the necessary certificates from the gymnasial authorities, which are regarded as of an equivalent minimal value all over Germany, are presented to the university authorities. If these papers are found to be in order, the applicant is admitted to "academic citizenship" by the rector, to whom he gives his hand in token of agreement to observe all the laws of the university. The entering student is registered in the university as a whole, and in one of the faculties.

Foreigners are very freely admitted to the full privileges of the university if they give evidence of proper qualifications; thus the diploma of an American college of any prominence is accepted without hesitation, though the A.B. degree of an American college by no means always represents as extensive or thorough training as the *Maturitätszeugniß* of a German *Gymnasium*, which is fully the equivalent of the ordinary B.A. degree of the English universities. Permission to attend lectures, without matriculation, is given freely, especially to foreigners, the consent of the lecturer being generally required; but such attendance has no official value as entitling to admission to the State Examinations. A candidate who presents an incomplete "certificate of maturity" may attend lectures in the philosophical faculty only, but these count for no purpose for which the university degree is required. Of late years some of the universities have shown themselves unwilling to confer degrees in philosophy upon foreigners who cannot show themselves possessed of a good classical training. A candidate for matriculation who has attended another university must show his papers in due form of ex-matriculation from that university; these are not granted until the student has satisfied all his obligations toward the university which he proposes to leave.*

When matriculated the student receives a card bearing his name, faculty, and address. This must be renewed at certain intervals, and whenever his address is changed; it is to be always carried on the person, under penalty of a fine. This card gives the bearer certain privileges, which were much greater formerly than at present. In former times a student, if arrested for any misdemeanor by a civil officer, could be detained by the town authorities only until the arrival of a university beadle, who then took the offender into custody for trial before the university court. If found guilty, the offender was punished by the university authorities. Since 1879, the exclusive jurisdiction of the university authorities over the students embraces only matters of discipline.

Since the extension to all German states of the laws rendering military service compulsory upon all German subjects physically able to serve, but accepting a service "with the colors" of only one year from those who can pass a certain examination, it has become very common to serve out this year during the university course. The military authorities have made this easier by establishing small garrisons in the university-towns where formerly none were stationed. The *Einjährigen* are not obliged to live in barracks, and their military exercises are so timed as to leave them opportunity for university work.

The student is free to select whatever courses of lectures he chooses, and there is no penalty for non-attendance of these.† During their first semester probably only a small minority of students expect to do much serious work; the sudden sense of freedom, following the rigorous discipline and restraint of the gymnasial course (nine years in its full extent) is too intoxicating for the student to resist its temptations to idleness. But it should be remembered that the entering German student is not often under nineteen years of age, and that students who waste much time in their first semester often make very brilliant reputations afterwards. Matthew Arnold was of the opinion that the proportion of students who really work, is considerably larger in a German than in an English university, notwithstanding the closer watch kept over the English students. In the choice of lectures he may seek the advice of one or more professors; but often the new student, especially if he be enrolled in the philosophical faculty, subscribes to a great number of courses before deciding upon his particular line of work. A record is kept of all the courses of lectures chosen during his university course, but

* Except when *Stundung* is granted, as explained below.

† For failure to subscribe for any courses at all the penalty of dropping from the rolls is prescribed; in 1891, 161 students were thus dropped at Berlin.

not of his attendance upon each lecture. He receives a blank-book in which he enters the names of the courses; payment of the necessary fees is then certified therein by the *Quæstor*, and at the end of the semester the lecturer inserts his certificate of the student's attendance, generally without the formality of ascertaining whether the student has attended or not. Students in the faculties of theology, law, and medicine often attend courses in the faculty of philosophy; indeed, in the Bavarian universities such attendance, for one or two semesters, is obligatory.

Change from one university to another during the student's academical career is extremely common. The North German students are especially migratory, Heidelberg, Freiburg, Tübingen, and other places, proving very attractive in summer through the beauty of their surroundings, so that such universities are often nicknamed the "summer universities."* The result of this migratoriness is an entire want of loyalty to any one university, it sometimes happening that one may take his degree where he has studied least. The entire absence of athletic contests between the universities and, in fact, of athletic sports among the students at all, is one of the first points of difference between the German universities and those of his native land to strike the student who comes from England or America.

In general, the universities exercise no control over the mode of living of their students, each being completely free to live where he wishes. There are no college rooms, as in English and American colleges, nor any common table. Provision is, however, made for poor students in various ways. Thus at Leipsic there exists the so-called *Convict*, which supplies dinner and supper daily during the term to about 280 students free of charge; and some of the professors receive deserving students at their own tables. A custom called *Stundung* exists in some universities, and is as follows: on presentation of the *testimonium paupertatis* the student is excused from the immediate payment of a part or even the whole of the lecture-fees, but engages to pay them within a certain time after receiving an appointment under the government. It is also in the power of the lecturer to remit the fees entirely to any individual student. At Berlin the *Melanchthoneum* and *Johanneum* are institutions of similar character, containing also rooms at low prices for a limited number. At Tübingen there exist two institutions which have at present no parallel in other universities of Germany. These are royal foundations for the maintenance of Protestant and Roman Catholic students of theology. The foundation for Protestants is called the "Evangelical-Theological Seminary," but locally the *Stift*, and dates from 1536; that for Catholics, the *Wilhelmsstift* (but locally the *Konvikt*), was established in Tübingen in 1817, in which year the faculty of R. C. theology, which had previously existed at Ellwangen, was transferred to Tübingen. Residence in these institutions, which bear some resemblance in constitution to the colleges at Oxford and Cambridge, is obligatory upon theological students (the *Stift* receives also a number of students from the faculty of philosophy), who are under the control of officers called *Repetenten*, and are rather strictly governed—almost the only survival in German universities of a system which once prevailed extensively.

The students in the faculties of theology, law, and philosophy are not held to any examinations during their stay at the universities. Medical students have to pass, about two years after entrance, the so-called *tentamen physicum*, an examination in anatomy, physiology, physics, chemistry, botany, and zoology. It is held publicly and orally, in the presence of the dean of the medical faculty, and is extremely strict. The examiners are professors of the university, in their capacity as such, and not as members of the State Examining Commission. Those students who intend to proceed to a degree make application for the examination at their own pleasure, after passing the required number of semesters. For the faculties of theology and law the minimum is six semesters, or three years. In the philosophical faculty the number of semesters usually gone through is also six, though here there is no prescribed minimum; but it is always at the option of the faculties to refuse an application, and only a student of unusual attainments would be admitted to examination in less than three years after his entrance to the university. Still, in the case of foreign students, who are generally older men, exceptions are more readily made. In the medical faculty the minimum is nine or ten semesters.

The only degrees given by the German universities at the present day are those of *doctor* and *licentiate*;† the latter is given only in theology. The university degrees do not, as such, admit the recipient to the exercise of his profession in the church, the law, medicine, or the higher teaching-service; for this, the passing of the State Examination is necessary. Attempts have been made to give the university degrees this power, but thus far without success; and it is extremely unlikely that any of the German states will make such a concession.

The process of obtaining the doctor's degree in the faculty of law differs slightly from

* Thus, while the total number of matriculated students at the twenty universities of the German Empire (excluding Braunsberg and Münster) was in the S. S., 1890, 28,921; in the W. S., 1890-91, 28,326, a decrease of 595, an increase was shown by the following: Berlin (746), Leipsic (281), Erlangen (48), Strassburg (45), Rostock (41), all the rest exhibiting a decrease. The most considerable decrease was shown by Freiburg (323), Bonn (205), Tübingen (172), Munich (169), Kiel (145).

† Some universities (e.g. Tübingen) still word their diplomas *artium liberalium magistrum et doctorem philosophiæ*, but the master's title is never used by the recipient.

that followed in the faculties of medicine and philosophy.* In all, the presentation and acceptance of a dissertation is the prerequisite to examination. The difference just mentioned consists in this, that in the legal faculty the subject of the dissertation is assigned to the candidate on his application for an examination, and a certain time, generally six weeks, is given him for its completion, while in the other faculties the candidate selects his own subject, of course with the advice of the professor with whom he has chiefly pursued his studies. The dissertation must be an entirely original investigation (a declaration to this effect being signed by the candidate), and it must be an actual contribution to science; no mere compilation, however much learning it might embody, would be accepted. Formerly the dissertation was required to be written in Latin, but nowadays this is obligatory only for dissertations in the field of classical philology; and the university authorities are generally very tolerant in this respect, dissertations in German, English, French, or Italian, and sometimes in other modern languages, being accepted without objection. The printing of the dissertation is obligatory in most universities; there are varying regulations concerning the number of copies to be presented free of cost to the university. The candidate must first receive his exmatriculation in due form; he then hands to the dean of his faculty the certificate to this effect, the certificates of attendance upon lectures, *Seminare*, etc., his dissertation, and a brief sketch of his school and university career. This *vita*, as it is called, is generally required to be written in Latin. At the same time he makes formal application for examination, and, if he seeks the degree of Doctor of Philosophy, states the subjects (*Fächer*) in which he wishes to be examined. The chief subject (*Hauptfach*) is the one with which his dissertation concerns itself. In most universities three subjects are required, and these are expected to be broad enough to insure a very thorough test of the candidate's knowledge. If the papers are found to be in order, and the dissertation accepted, the dean after consultation with the professors appoints a time for the examination. There is no time of year especially set apart for examinations. The examination is oral, and in the presence of as many of the faculty as choose to attend, and any professor has the right to question the candidate. In some universities (e.g., at Bonn) the candidate is bound to defend his dissertation publicly, but this has become a pure formality. The customs attending the actual conferring of the degree vary; in general they are extremely simple. Different universities have different formulæ which are employed in the diplomas to indicate the degree of excellence which the candidate has displayed in dissertation and examination. Generally three grades are recognized: *cum laude*, *magna cum laude*, *summa cum laude*; but at some universities (e.g., at Tübingen) *cum laude* denotes the highest grade, the lowest being indicated by the words *post comprobatam eruditionem*, the second by *post eruditionem bene comprobatam*.

It is felt in all the German universities that the real test of the candidate's worthiness lies in the courses of lectures which he has attended, in the work which he has done under the observation of one or more professors in the *Seminar*, the philological or archaeological or grammatical or historical society, the laboratory, etc., and above all in his dissertation, rather than in the examination. Cases of the rejection of dissertations are not by any means rare; but cases of the rejection of a candidate whose dissertation has been accepted, by reason of an unsatisfactory examination, are rare. The German system has the very great merit of discouraging "cramming," which in the majority of cases is made useless by the wide range of the subjects and the latitude allowed the examiners. Matthew Arnold says (*Higher Schools and Universities on the Continent*, p. 231): "As I have again and again begged the English reader to remark, the examination-test is never used in Prussia as sufficient in itself; it is only used to make the assurance of a good education doubly sure; the really good education is regarded as the main assurance."

Theological students are examined for admission to orders by commissions appointed by the authorities of the church to which they belong; the state requires that they shall have pursued a course of theological study for at least three years at a German university, and shall pass a State Examination in philosophy, history and German literature at the end of the course, but not that they shall take a university degree. By a law passed in 1882, a certificate of attendance at courses of lectures on these subjects in the philosophical faculty may replace the State Examination. Students of law, in the majority of cases, do not seek the doctor's degree; for their admission to the bar a course of legal study at the university for at least six semesters, and two examinations, for the positions of *Referendarius* and *Assessor* respectively, are prescribed. These examinations are held by commissions appointed by the Minister of Justice. The first, the *Referendariatsexamen*, coming at the close of the university course, is chiefly theoretical; the *Assessorexamen* is held four years later, and is chiefly practical. The interval between the two examinations must be spent in practical work, for which minute regulations are prescribed. Medical students have to pass the *tentamen physicum*, already referred to. The doctor's degree is almost always sought by them, though not necessary to practice; but it does not exempt from the State Examination. This latter is held from two and a half to three years after the *tentamen physicum*; the examining com-

* In universities where the faculty of philosophy has been divided, the process is the same in all the resulting faculties, and the degree bestowed is likewise Doctor of Philosophy.

mission is appointed by the government, but in fact consists almost exclusively of university professors. Licenses for the practice of dentistry, and of veterinary surgery, emanate also from the *Cultusministerium*. Dentists must have followed a medical course for two years at a university; veterinary surgeons must have completed a course of at least three and a half years, of which the first three semesters may be at a university. Apothecaries, among other severe requirements, have to show a certificate of at least three semesters' attendance at a university, or at the *Collegium Carolinum* at Brunswick, or at the Polytechnic Schools at Stuttgart or Carlsruhe.

Candidates for the *facultas docendi*, or right to teach in the higher schools (*Gymnasia*, *Progymnasia*, *Realschulen*, *höhere Bürgerschulen*) must likewise pass a State Examination, from which the attainment of the doctor's degree exempts only in this particular, that the doctor-dissertation is accepted in place of a dissertation for the subject in which the candidate expects to teach, so far as it covers the ground of that department; for any other subject he must write a new dissertation, six months' time being allowed him for this. The State Examination for the higher school service is extremely severe; in Prussia it is regarded as the most difficult of all the examinations for the Civil Service.

Statistics of the German Universities.—The following table, taken from the very valuable work of Conrad (*The German Universities for the Last Fifty Years*) shows the average attendance at all the universities of the German Empire (including Münster, but not Braunsberg) for each decennium during the fifty years beginning with 1831; also the numbers matriculated in 1830-31 and in 1882-3. It should be remembered that in the period, 1871-81, the university of Strassburg was reopened, and the territory of Germany increased by the addition of Alsace-Lorraine:

| | Number of matriculated students. | Per. 100,000 inhabitants. |
|--------------|-------------------------------------|------------------------------|
| 1830-31..... | 15,751 | 52.5 |
| '31-41..... | average 12,247 | 38.9 |
| '41-51..... | " 11,790 | 34.1 |
| '51-61..... | " 12,149 | 33.1 |
| '61-71..... | " 13,420 | 33.7 |
| '71-81..... | " 17,832 | 40.8 |
| '82-83..... | 24,187 | 52.5 |

In 1885 the number of matriculated students was 27,228, or 58.1 per 100,000; in 1890, 29,317, or 59.3 per 100,000; in 1890-91, 28,711, or 58.09, per 100,000.

The most striking fluctuations in attendance are exhibited by the theological faculties. The highest and lowest points reached are here given:

| <i>Protestant.</i> | <i>Catholic.</i> |
|--------------------|------------------|
| 1831.....4147 | 1831.....1801 |
| '51.....1631 | '40.....866 |
| '60.....2520 | '50.....1393 |
| '76.....1539 | '60.....1700 |
| | '80.....619 |

After 1881 a remarkable reaction sets in, as the following table shows:

| <i>Protestant.</i> | <i>Catholic.</i> |
|--------------------|------------------|
| 1882-83.....3168 | |
| '83-84.....3614 | 825 |
| '85.....4469 | 1080 |
| '86-87.....4584 | 1164 |
| '90.....4544 | 1262 |

In the other faculties the fluctuations have been much less striking. For complete statistics, and a careful discussion of the causes of the fluctuations, the reader is referred to the work of Conrad.

The following table, from Ascherson's *Universitätskalender* for the summer of 1891, gives the most recent statistics attainable of the attendance and number of teachers at the universities of the German Empire and of Switzerland, at Dorpat, and at the German-speaking universities of Austria-Hungary:

| | TEACHERS. (Summer, 1891.) | | | | | | STUDENTS. (Winter, 1890-91.) | | | | | | | |
|---------------------------------|------------------------------|---------------------------|----------------------|----------------------------------|-----------------------------|--------|---------------------------------|-----------|---------------------------------------------|------------------------|----------------------------------------------------------------|---------------------------------|-----------------------------------------|----------------------------|
| | Ordinary Professors. | Extraordinary Professors. | Honorary Professors. | Privatdozenten, Assistants, etc. | Teachers of Languages, etc. | Total. | Matriculated. | | | | | | | |
| | | | | | | | THEOLOGY. | | Jurisprudence, Political Economy, Forestry. | Medicine and Pharmacy. | Philosophy, Philology, History, Mathematics, Natural Sciences. | Total of Matriculated Students. | Unmatriculated, but Attending Lectures. | Grand Total of Attendance. |
| | | | | | | | Evangelical. | Catholic. | | | | | | |
| I.—German Empire. | | | | | | | | | | | | | | |
| Berlin..... | 81 | 88 | 8 | 141 | 17 | 335 | 737 | ... | 1630 | 1397 | 1743 | 5527 | 2567 | 8094 |
| Bonn..... | 60 | 30 | 2 | 28 | 4 | 124 | 119 | 149 | 271 | 281 | 399 | 1219 | 44 | 1263 |
| Breslau..... | 62 | 34 | 4 | 34 | 7 | 141 | 165 | 168 | 233 | 303 | 377 | 1246 | 36 | 1282 |
| Erlangen..... | 40 | 6 | ... | 9 | 5 | 60 | 285 | ... | 212 | 389 | 168 | 1054 | 10 | 1064 |
| Freiburg i. B. | 43 | 22 | 4 | 27 | 5 | 101 | ... | 203 | 120 | 351 | 257 | 931 | 72 | 1003 |
| Giessen..... | 36 | 10 | ... | 15 | 3 | 64 | 94 | ... | 161 | 175 | 119 | 549 | 28 | 577 |
| Göttingen..... | 65 | 22 | 5 | 24 | 7 | 123 | 226 | ... | 185 | 214 | 265 | 890 | 23 | 913 |
| Greifswald..... | 45 | 18 | ... | 12 | 7 | 82 | 250 | ... | 69 | 371 | 83 | 773 | 11 | 784 |
| Halle..... | 51 | 35 | 2 | 33 | 12 | 133 | 692 | ... | 128 | 269 | 496 | 1585 | 63 | 1648 |
| Heidelberg..... | 44 | 36 | 7 | 26 | 10 | 123 | 77 | ... | 236 | 299 | 358 | 970 | 138 | 1108 |
| Jena..... | 37 | 24 | 8 | 16 | 4 | 89 | 100 | ... | 95 | 214 | 195 | 604 | 51 | 655 |
| Kiel..... | 43 | 14 | 1 | 30 | 5 | 93 | 91 | ... | 50 | 237 | 111 | 489 | 24 | 513 |
| Königsberg..... | 47 | 23 | ... | 23 | 8 | 101 | 178 | ... | 135 | 235 | 134 | 682 | 18 | 700 |
| Leipzig..... | 67 | 51 | 11 | 56 | 4 | 189 | 565 | ... | 1090 | 944 | 859 | 3458 | 81 | 3539 |
| Marburg..... | 48 | 11 | 1 | 25 | 8 | 93 | 169 | ... | 140 | 242 | 304 | 855 | 76 | 931 |
| Munich..... | 67 | 19 | 4 | 70 | 5 | 165 | ... | 158 | 1360 | 1348 | 516 | 3382 | 32 | 3414 |
| Münster (Acad.).... | 21 | 11 | ... | 4 | 7 | 43 | ... | 227 | ... | ... | 158 | 385 | 13 | 398 |
| Rostock..... | 31 | 7 | ... | 5 | 2 | 45 | 56 | ... | 55 | 136 | 124 | 371 | ... | 371 |
| Strassburg..... | 62 | 19 | 2 | 28 | 4 | 115 | 121 | ... | 203 | 329 | 294 | 947 | 51 | 998 |
| Tübingen..... | 50 | 16 | ... | 17 | 6 | 89 | 328 | 167 | 406 | 234 | 113 | 1250 | 16 | 1266 |
| Würzburg..... | 37 | 12 | 1 | 22 | 3 | 75 | ... | 148 | 306 | 963 | 127 | 1544 | 46 | 1590 |
| | 1037 | 508 | 60 | 645 | 133 | 2383 | 4273 | 1220 | 7085 | 8931 | 7200 | 28711 | 3400 | 32111 |
| II.—Switzerland. | | | | | | | | | | | | | | |
| Basle..... | 38 | 19 | ... | 29 | 4 | 90 | 114 | ... | 40 | 127 | 107 | 388 | 37 | 425 |
| Berne..... | 43 | 14 | 1 | 44 | 1 | 103 | 42 | 8 | 136 | 263 | 97 | 546 | 108 | 654 |
| Freiburg i. S. | 35 | ... | ... | 3 | ... | 58 | ... | 64 | 46 | ... | 28 | 138 | ... | 138 |
| Geneva..... | 46 | 9 | 12 | 42 | ... | 109 | 28 | ... | 72 | 219 | 144 | 463 | 206 | 669 |
| Lausanne..... | 25 | 33 | ... | 7 | 1 | 66 | ? | ... | ? | ? | ? | ? | ? | ? |
| Neuchâtel (Acad.).... | 28 | 3 | 7 | 6 | ... | 44 | ? | ... | ? | ? | ? | ? | ? | ? |
| Zürich..... | 40 | 13 | ... | 54 | 4 | 111 | 37 | ... | 63 | 272 | 165 | 537 | 97 | 634 |
| | 255 | 91 | 20 | 185 | 10 | 561 | ? | ? | ? | ? | ? | ? | ? | ? |
| III.—Russia, Balt. Prov. | | | | | | | | | | | | | | |
| Dorpat..... | 39 | 5 | ... | 22 | 10 | 76 | 284 | ... | 160 | 1032 | 236 | 1812 | 10 | 1822 |
| IV.—Austria-Hungary. | | | | | | | | | | | | | | |
| Czernowitz..... | 24 | 7 | ... | 4 | 3 | 38 | ... | 64* | 151 | 27 | 14 | 256 | 54 | 310 |
| Graz..... | 50 | 20 | ... | 35 | 3 | 108 | ... | 119 | 428 | 651 | 55 | 1253 | 161 | 1414 |
| Innsbruck..... | 42 | 17 | 3 | 22 | 1 | 85 | ... | 335 | 198 | 350 | 54 | 837 | 168 | 1005 |
| Prague..... | 52 | 18 | 2 | 34 | 4 | 110 | ... | ? | ? | ? | ? | ? | ? | ? |
| Vienna..... | 85 | 47 | 2 | 176 | 14 | 325 | ... | 216 | 1578 | 2202 | 413 | 4409 | 1811 | 6220 |
| | 254 | 109 | 7 | 271 | 25 | 646 | ... | ? | ? | ? | ? | ? | ? | ? |

* Greek Orthodox.

The number of foreign students at the German universities for the summer of 1891 was given as 1930; of these 436 were Americans (nearly all from the United States), 331 Russians, 293 Austrians, 255 Swiss, 117 Englishmen. At the university of Berlin alone 208 Americans were registered.

The overcrowding of the German universities, or, more correctly, the overproduction of scholars in Germany, has become a very troublesome and difficult question for the authorities to deal with. In the theological faculties this problem has not yet to be faced; the contrary problem, that of a deficiency in the number of candidates for orders, having confronted the ecclesiastical authorities; nor has the number of intending physicians become alarmingly great. But in the faculty of law, and above all in that of philosophy, the multitude of candidates has greatly outgrown the number of places to be filled, giving rise to the expression *Hungercandidaten*, i.e., "candidates for starvation." In Prussia an overcrowding of the legal profession has been so marked at several periods that the Minister of Education has caused warning to be given to the *Abiturienten* in the gymnasia against too hasty selection of a course of legal study. "This was done at the beginning of the *thirties*, of the *fifties*, and now again of the *eighties*. In the former periods the caution took very speedy and very great effect, and on the present occasion likewise we shall probably not have long to wait for the turn of the tide." (Conrad, 1884.)

Toward the admission of women to the German universities not even the first step can be said to have been taken. Occasionally women have received permission to attend lectures, but even this has been very grudgingly granted.

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Lists of lectures are given in Ascherson's *Deutscher Universitäts-Kalender*, published at Berlin, and the *Deutsches Akademisches Jahrbuch* (Leipsic).

DUTCH AND BELGIAN UNIVERSITIES.—The universities of the Netherlands, like those of Protestant Germany, were founded by the state as schools for the maintenance of the principles of the Reformation and the education of the clergy; and afforded in the 16th and 17th centuries a grateful refuge to not a few of those Huguenot or Port-Royalist scholars whom persecution compelled to flee beyond the boundaries of France, as well as to the Puritan clergy who were driven from England. The earliest, that of Leyden, founded in 1575, commemorated the gallant and successful resistance of the citizens to the Spanish fleet under Requesens. Throughout the 17th century Leyden was distinguished by its learning, the ability of its professors, and the shelter it afforded to the more liberal thought associated at that period with Arminianism. Douza was, for Leyden and the Dutch, what Münchausen afterwards was for Göttingen and the German universities, but with this difference: Leyden was the model on which the younger universities of the republic were constructed; Göttingen the model on which the older universities of the empire were reformed. Both Münchausen and Douza proposed a high ideal for the schools founded under their auspices; and both, as first Curators, labored with paramount influence in realizing this ideal for the same long period of thirty-two years. Under their patronage Leyden and Göttingen took the highest place among the universities of Europe; and both have only lost their relative supremacy by

the application in other seminaries of the same measures which had at first determined their superiority. The appointment of the professors at Leyden was vested in three (afterwards five) Curators, one of whom was selected from the body of the nobles, while the other two were appointed by the states of the province, the office being held for nine years, and eventually for life. With these was associated the mayor of Leyden for the time being. The University of Franeker was founded in 1585, on a somewhat less liberal basis than Leyden, the professors being required to declare their assent to the rule of faith embodied in the Heidelberg Catechism and the confession of the "Belgian Church." Its four faculties were those of theology, jurisprudence, medicine, and "the three languages and the liberal arts." For a period of twelve years (1610-1622) the reputation of the university was enhanced by the able teaching of William Ames ("Amesius"), a Puritan divine and moralist, who had been driven by Bancroft from Cambridge and from England. His fame and ability are said to have attracted to Franeker students from Hungary, Poland, and Russia.

Later, there were founded in 1600 the University of Harderwijk; in 1614 that of Groningen; and, in 1634, that of Utrecht. The restoration of the House of Orange, and establishment of the kingdom of the Netherlands (23d March, 1815), was followed by important changes in connection with the whole kingdom. The Universities of Franeker and Harderwijk were suppressed, while their place was taken by the newly founded centres at Ghent (1816) and Liège (1816). A uniform constitution was given both to the Dutch and Belgian universities. It was also provided that there should be attached to each a Board of Curators, consisting of five persons, "distinguished by their love of literature and science and by their rank in society." These Curators were to be nominated by the king, and at least three of them chosen from the province in which the university was situated, while the other two were to be chosen from adjacent provinces. After the redivision of the kingdom in 1831, Ghent and Liège were constituted state universities, and each received a subsidy from the Government. (See BELGIUM.)

In Holland, the foundation of the University of Amsterdam (1877) has more than repaired the loss of Franeker and Harderwijk, and the progress of this new centre during the ten years of its existence has been remarkably rapid, so that it bids fair to rival both Utrecht and Leyden. The higher education of women has made some progress in the Netherlands; and in 1883 there were eighteen women studying at Amsterdam, eleven at Groningen, four at Leyden, and seven at Utrecht.

Belgium at the present time has four universities; Liège and Ghent (state universities); Louvain (clerical); Brussels (free). In 1890, there was allotted in the budget the sum of 1,644,900 francs for university education. The following table gives the statistics of the Belgian universities for 1890:

| Universities. | Students of | | | | | Total. |
|---------------|-------------|----------------|-------------|-----------|-----------|--------|
| | Theology. | Jurisprudence. | Philosophy. | Medicine. | Sciences. | |
| Brussels..... | .. | 423 | 153 | 568 | 526 | 1670 |
| Ghent..... | .. | 189 | 62 | 193 | 172 | 616 |
| Liège..... | .. | 356 | 299 | 299 | 337 | 1207 |
| Louvain..... | 63 | 424 | 183 | 468 | 326 | 1454 |

Attached to the universities are various special schools of engineering, arts, manufactures, mining, etc., with a combined attendance of 913 students in 1888-89.

FRENCH UNIVERSITIES.—In France, or rather in the territory included within the boundaries of modern France, Montpellier was a recognized school of medical science as early as the 12th century. Guillaume VIII., lord of Montpellier, in the year 1181, proclaimed it a school of free resort, where any teacher of medical science, from whatever country, might give instruction. Before the end of the century it possessed also a faculty of jurisprudence, a branch of learning for which it afterwards became famed. The university of medicine and that of law continued, however, to be totally distinct bodies with different constitutions. Petrarch was sent by his father to Montpellier to study the civil law. On the 26th of October, 1289, Montpellier was raised by Nicholas IV. to the rank of a "studium generale," a mark of favor which, in a region where papal influence was so potent, resulted in a considerable accession of prosperity. The university also now included a faculty of arts; and there is satisfactory evidence of the existence of a faculty of theology before the close of the 14th century, although not formally recognized by the pope before the year 1421. In the course of the same century several colleges for poor students were also founded. The University of Toulouse is to be noted as the first founded in any country by virtue of a papal charter. It took its rise in the efforts of Rome for the suppression of the Albigensian heresy, and its foundation formed one of the articles of the conditions of peace imposed by Louis IX. on Count Raymond of Toulouse. In the year 1233 it first acquired its full privileges as a studium generale by virtue of a charter given by Gregory IX. This pontiff watched

over the university with especial solicitude, and through his exertions it soon became a noted centre of theological, and especially of Dominican, teaching. As a school of arts, jurisprudence, and medicine, although faculties of each existed, it never attained to any reputation. The University of Orléans had a virtual existence as a *studium generale* as early as the first half of the 13th century; but in the year 1305 Clement V. endowed it with new privileges, and gave its teachers permission to form themselves into a corporation. The schools of Orléans had an existence, it is said, as early as the 6th century, and subsequently supplied the nucleus for the foundation of a university at Blois; but of this university no records now exist. Orléans, in its organization, was modeled mainly on Paris, but its studies were complementary rather than in rivalry to the older university. The absorbing character of the study of the civil law, and the mercenary spirit in which it was pursued, had led the authorities at Paris to refuse to recognize it as a faculty. The study found a home at Orléans, where it was cultivated with an energy which attracted numerous students. In January, 1235, we find the bishop of Orléans soliciting the advice of Gregory IX. as to the expediency of countenancing a study which was prohibited in Paris. Gregory decided that the lectures might be continued; but he ordered that no beneficed ecclesiastic should be allowed to devote himself to so eminently secular a branch of learning. Orléans subsequently incorporated a Faculty of Arts, but its reputation from this period was always that of a school of legal studies, and in the 14th century its reputation in this respect was surpassed by no other university in Europe. Prior to the 13th century it had been famed for its classical learning, and Angers, which received its charter at the same time, also once enjoyed a like reputation, which, in a similar manner, it exchanged for that of a school for civilians and canonists. The roll of the university forwarded in 1378 to Clement VII. contains the names of 8 professors *utriusque juris*, 2 of civil and 2 of canon law, 72 licentiates, 284 bachelors of both the legal faculties, and 190 scholars. The University of Avignon was first recognized as a *studium generale* by Boniface VIII., in the year 1303, with power to grant degrees in jurisprudence, arts, and medicine. Its numbers declined somewhat during the residence of the popes, owing to the counter attractions of the *studium* attached to the curia; but after the return of the papal court to Rome it became one of the most frequented universities in France, and possessed at one time no less than seven colleges. The University of Cahors enjoyed the advantage of being regarded with especial favor by John XXII. In June, 1332, he conferred upon it privileges identical with those already granted to the University of Toulouse. In the following October, again following the precedent established at Toulouse, he appointed the *scholasticus* of the cathedral chancellor of the university. In November of the same year a bull, couched in terms almost identical with those of the Magna Charta of Paris, assimilated the constitution of Cahors to that of the oldest university. The two schools in France which, down to the close of the 14th century, most closely resembled Paris, were Orléans and Cahors. The civil immunities and privileges of the latter university were not, however, acquired until the year 1367, when Edward III. of England, in his capacity as Duke of Aquitaine, not only exempted the scholars from the payment of all taxes and imposts, but bestowed upon them the peculiar privileges known as *privilegium fori*. Cahors also received a license for Faculties of Theology and Medicine, but, like Orléans, it was chiefly known as a school of jurisprudence. It was a *studium generale* in the same three faculties that Grenoble, in the year 1339, received its charter from Benedict XII. The university never attained to much importance, and its annals are for the most part involved in obscurity. At the commencement of the 16th century it had ceased altogether to exist, was reorganized by Francis of Bourbon in 1542, and in 1565 was united to the University of Valence. The University of Perpignan, founded, according to Deniflé, in 1379, by Clement VII. (although tradition had previously ascribed its origin to Pedro IV. of Aragon), and that of Orange, founded in 1365 by Charles IV., were universities only by name and constitution, their names rarely appearing in contemporary chronicles, while their very existence becomes at times a matter for reasonable doubt.

In modern France, since the revolution, the word university has acquired a meaning widely different from that which it bears in other countries; the expression, "*Université de France*," being nearly equivalent to "national system of education of France." All the old universities of the country having been swept away at the revolution, education had fallen into abeyance. After various attempts at the establishment of primary, secondary, and central schools in the departments, the imperial government adopted a new system, by which the whole educational machinery of the country was centralized at Paris, and committed to a body called the University, with a Grand Master at its head, assisted by a Council. The system has since undergone various alterations. The governing body, as well for the higher educational institutes as for the elementary schools, is the ministry of public instruction, supported by a supreme educational council and 18 inspectors-general. France is divided into 16 educational districts, the so-called academies, within the bounds of which exist one or more of the Faculties of Theology, Law, Medicine, and Science and Literature. Such faculties are found in 18 towns, and in Paris; but only in the latter are the five co-existing faculties organized into a university. The monopoly, hitherto enjoyed by the University of France, of opening schools of law and medicine, and of conferring degrees, was abolished by a law passed in 1875.

There are 15 *facultés des lettres* at Paris, Aix, Besançon, Bordeaux, Caen, Clermont, Dijon, Lille, Grenoble, Lyon, Montpellier, Nancy, Poitiers, Rennes, and Toulouse. At all of these, except Aix, are also *facultés des sciences*, besides one at Marseilles. There are also 2 *facultés* of Protestant theology, 15 *facultés de droit*, and 6 *facultés de médecine*. In January, 1888, there were 4908 students of law; 5321 students of medicine; 2320 students of pharmacy. To the support of the *facultés* the sum of 11,600,370 francs was set down in the budget of 1891. The Roman Catholic theological *facultés* were suppressed in 1885, but the Catholic universities exist still on condition of their professors submitting to the usual State examinations.

SPANISH AND PORTUGUESE UNIVERSITIES.—In Spain, the universities at present existing are those of Barcelona, Grenada, Madrid (transferred in 1837 from Alcalá), Oviedo, Salamanca, Santiago, Seville, Valencia, Valladolid, and Zaragoza. They are all, with the exception perhaps of Madrid, in a lamentably depressed condition, and mainly under the influence of French ideas and modeled on French examples. But in Portugal, Coimbra, which narrowly escaped suppression in the 16th century as a suspected centre of political disaffection, is now a flourishing school. Its instruction is given gratis; but, as all members of the higher courts of judicature and administration in the realm are required to have graduated at the university, it is at the same time one of the most aristocratic schools in Europe. There are five faculties,—viz., Theology, Jurisprudence, Medicine, Mathematics, and Philosophy. Of these, that of law is by far the most flourishing, the number of students in this faculty nearly equaling the aggregate of all the rest. There is a valuable library, largely composed of collections formerly belonging to suppressed convents. As a school of theology, Coimbra is distinctly anti-ultramontane, and the progressive spirit of the university is shown by the fact that the rector has lately been instructed by the government to devise a scheme for the admission of women.

RUSSIAN UNIVERSITIES.—Russia possesses, besides Dorpat, already described among the German universities, seven other universities. (1) Helsingfors, in Finland, was originally established by Queen Christina in Abo (1640), and removed in 1826 to Helsingfors, where the original charter, signed by the celebrated Oxenstierna, is still preserved. It has four faculties, 38 professors, and 700 students. (2) Moscow is really the oldest Russian university, having been founded in 1755. It includes the Faculties of History, Physics, Jurisprudence, and Medicine; the professors are 69 in number, the students about 1660. (3) The University of St. Vladimir at Kieff, originally founded at Vilna in 1803, was removed from thence to Kieff in 1833; the students number about 900, and the library contains 107,000 volumes. (4) Kazan (1804) includes the same faculties as Moscow; the students are about 450 in number, and it has a library containing 80,000 volumes. (5) Hharkoff (1804) numbers 600 students, and its library 55,000 volumes. (6) St. Petersburg (1819) includes the four faculties of History, Physics, Jurisprudence, and Oriental languages, and numbers 1500 students. (7) Odessa, founded in 1865, represents the university of New Russia. Generally speaking, the universities of Russia are not frequented by the aristocratic classes; they are largely subsidized by the Government, and the annual fees payable by students are less than \$35 a head. In 1863 the statutes of all the universities were remodeled; and since that time there has been a tendency to impress upon them a more national character, as distinguished from mere imitation of those in Germany.

SWEDISH AND DANISH UNIVERSITIES.—Nearly contemporaneous with the foundation of Göttingen in Germany, were those of Upsala in Sweden (1477) and Copenhagen in Denmark (1479), which, although lying without the political boundaries of Germany, reflected her influence. The charter for Copenhagen was given by Sixtus IV. as early as 1475. The students attracted to this new centre were mainly from within the radius of the University of Cologne, and its statutes were little more than a transcript of those of the latter foundation. In Sweden the University of Lund, founded in 1668 and modeled on the same plan as its predecessor at Upsala, has adhered to its antiquated constitution with remarkable tenacity. At both these universities the mediæval division into "nations" is still in force among the students, the number at Upsala being no less than thirteen. The faculty at both centres is much below the modern requirements in point of numbers. The University of Christiana in Norway, founded in 1811, and the Swedish universities, are strongly Lutheran in character; and all alike are closely associated with the ecclesiastical institutions of the Scandinavian kingdoms. The same observation applies to Copenhagen, where, however, the labors of Rusk and Madvig have done much to sustain the reputation of the university for learning. The University of Kiel (1665), on the other hand, has come much more under Teutonic influences, and is now a distinguished centre of scientific teaching. In 1890, the students at Upsala numbered 1791; at Lund, 855; at Christiana, 1620; at Copenhagen, 1300.

GREECE.—The University of Athens (founded May 22d, 1837) is modeled on the university systems of northern Germany and on a plan originally suggested by Professor Brandis. It includes four faculties—viz., theology, jurisprudence, medicine, and philosophy. The professors are upward of 60 in number; the students about 1500. There is also a school of pharmacy, chemistry, and anatomy, and a library of 130,000 volumes, with 800 manuscripts. In 1885, the budget contained 3,000,000 drachmas (\$600,000) as the governmental contribution to higher education.

AMERICAN UNIVERSITIES.—In the United States, popular usage employs the terms "university" and "college" indiscriminately of any higher institution of learning which possesses the power of conferring the usual academic degrees. This confusion prevails also in official nomenclature, for some of the oldest, richest, and most completely equipped of our universities still bear the name of "college," while in certain parts of the country, institutions inferior in endowment and in scholarly distinction to some of the secondary schools, are officially designated as "universities." Harvard and Yale, though long since equipped with the amplest facilities for university work, have only very recently put aside the name of "college," and the same is true also of Columbia and Princeton.

American universities may be classified in two ways: (a) with regard to their origin; or (b) with regard to their pædagogic character. Classified in the former way, they fall under three heads: (1) Universities that were originally endowed by private individuals; (2) universities that were established by some ecclesiastical body; and (3) universities that are founded and controlled by the state—meaning by the state, not the federal government, but the individual member of the Union.

In the first division, the best known examples are Harvard, Yale, Williams, Bowdoin, Amherst, Brown, Cornell, Johns Hopkins, and the Leland Stanford, Jr., University. To the second division belong Columbia, Trinity (Connecticut), Wesleyan, Union, Chicago, Princeton, Hamilton, Rochester, the University of the South, Racine, Kenyon, Lake Forest, Allegheny, and Oberlin. It must not be understood that these universities have necessarily remained essentially denominational in the *personnel* of their faculties, or that they now have any especial ecclesiastical leanings. This is true of some, to be sure, but others have only an historical connection with a particular church. Of the third division are the various state universities, the best known of which are the University of Vermont, the University of New York, the University of Virginia, the University of Michigan, the University of North Carolina, the University of Pennsylvania, the University of Indiana, the University of Illinois, and the University of California. In many instances the state, instead of establishing a new university, liberally aided an existing institution, claiming in return certain privileges and a share of control in its government. This is true, for example, of the relations of the state of New Hampshire with Dartmouth College; of Massachusetts with Harvard University, and of New Jersey with Princeton.

Classified with reference to their pædagogic character, American universities may be roughly grouped under two general heads: (1) Universities that are equipped for the prosecution of original investigation and research in the various departments of study, besides usually having connected with them the various professional schools, representing the faculties of law, medicine, theology, and natural science; and (2) universities, so-called, that perform chiefly the disciplinary and preparatory work which in Germany is the function of the *gymnasium* and the *real-schule*. (See GYMNASIA). These latter institutions have, in general, a prescribed course leading to the degree of Bachelor of Arts (modified in some cases as to the degrees of Bachelor of Letters, Bachelor of Science, or Bachelor of Philosophy), with the granting of which degree the responsibility of the institution usually ends.

Of the former class of universities, corresponding to the universities of Germany, are Harvard, Yale, Columbia, Princeton, Michigan, the Johns Hopkins University, Clark University, the University of Virginia, the University of Pennsylvania, the University of California, Boston University, the re-organized University of Chicago, Cornell University, and the North-Western University. In all of these, except Clark University, the gymnasial work is also done; but less stress is laid upon it than upon the more original work performed by those who have already received their first degree in Arts or Science, and who are consequently engaged in the special investigations that are to fit them for their life-work.

Among the institutions that belong to the second division, and that confine themselves chiefly to a very thorough performance of the gymnasial work leading to the first degree in Arts (and sometimes in Science), are Amherst, Williams, Bowdoin, Union, Trinity, Rutgers, Lafayette, Hampden-Sidney, Washington-and-Lee, Kenyon, Adelbert, Allegheny, Oberlin, Hobart, Vassar (for women), Wellesley (for women), Smith (for women), Olivet, St. Francis Xavier's, Haverford, Xenia, Fisk, Bates, Antioch, Charleston, Dickinson, Georgetown, Knox, Manhattan, Muhlenberg, Randolph-Macon, Swarthmore, Tufts, Wabash, Westminster, and William and Mary. Many of these offer facilities for advanced work in special lines of study, and some have faculties of law, but the "undergraduate course" in Arts forms in all, the most important portion of the university curriculum. The University of the State of New York is only an examining body like the University of London, or like Queen's in Ireland. See REGENT.

The organization of the universities of this country, and their local arrangements, differ considerably; but in the main, they reproduce the general features of the English and Scotch universities, with some marked exceptions. The teaching body is generally composed of Professors (Full Professors, Adjunct, Associate, or Assistant Professors), Tutors, Instructors, and Assistants. The organization is generally by departments, i.e., Greek, Latin, Mathematics, History, etc. At the head of each department is a full professor who exercises a general control over the work of the department, and

over the officers of instruction attached to it. To him the associate professors, tutors, etc., in the department, are responsible. He arranges the subjects of study, assigns the work of the subordinate instructors, and reports to the President or Chancellor from time to time upon the work accomplished. The President (or Chancellor) exercises a general supervision over the entire institution, and is the medium of communication between the faculty or faculties, and the "trustees," "overseers," "regents," or "governors" of the university—a body with whom usually rests the ultimate sovereignty of the institution, and who have exclusive control of the finances. These gentlemen are generally a body with the right of co-optation; but in some universities, as in Harvard and Dartmouth, the graduates elect a certain proportion of their number. In some of the state universities, as, for instance, the University of Michigan, the regents are elected by the popular vote, and the office has a semi-political significance. The right of interference with the internal concerns of the university is not always actively exercised. The trustees of Trinity (Conn.), for instance, meet regularly but once or twice a year, and practically only to ratify the action of the President and faculty. At Columbia, on the other hand, they meet every month, and exercise a very rigid control over even the purely educational policy of the university. The organization of the professors and instructors in American universities differs widely. In the institutions where most of the work is in Arts and Science, there is generally a single faculty. In the larger universities, the faculties are often wholly distinct, the President acting as the only bond between them. Each faculty, then, legislates independently of the others on matters affecting its own local interests, while questions affecting the university as a whole are left largely to the board of trustees, advised by the President and sometimes by the faculties acting separately. At Columbia, the German system of organization has been largely adopted and has been found to work smoothly and well. (See COLUMBIA COLLEGE.) In many colleges only professors are members of the faculties. In others, as at Yale, minor officers also have a seat, but with a fractional system of voting that makes the vote of a professor count for more than that of a tutor. Professors in American colleges receive a stated salary and are in nowise dependent upon the students' fees, except in the case of some of the faculties of medicine. This stated salary varies in the different institutions, according to the funds available, and also according to the nature of the work. In the older and wealthier universities, the average salary paid to a full professor is from \$2500 to \$4000. At Columbia, the highest salaries are paid, ranging from \$5000 to \$7500, this being practically necessary, however, owing to the increased cost of living in a city like New York. In all the older universities, there are chairs endowed by the generosity of private individuals, or of associations.

An American professor is always a teacher, and the amount of his time that must be devoted to actual lecturing and teaching (often as much as 18 hours per week), is usually prescribed for him by the college regulations. He has not the privilege accorded to the German professor, of "reading" or not, but must every year go through a certain number of courses of instruction, besides being expected, in many of the colleges, to assume a certain amount of responsibility for the morals and discipline of the undergraduates. This is a very serious obstacle in the way of his ability to carry on independent investigation and research, and makes the American professoriate a comparatively sterile body, though an improvement in this respect has been very noticeable in the past ten years. Harvard, Cornell, Columbia, the Johns Hopkins, and Clark University have now largely adopted the German conception of the professorial function, and allow the individual professor much greater liberty in the discharge of his duties than was formerly the case. Harvard, Columbia, and Cornell have likewise adopted the laudable plan of allowing each professor one year's leave of absence in seven, though with some diminution of salary.

The regular undergraduate course of study is one of four years; though it has been proposed at various times to cut it down to three, with an increase in the requirements for admission to the course. This is now invariably preceded either (1) by an entrance examination conducted by the university; or (2) the presentation of a certificate from a school licensed by the university to issue such a document. Harvard, Yale, and Williams, are among the universities that accept certificates from certain schools. The subjects for examination for entrance, are usually Greek, Latin, Algebra, Geometry, Arithmetic, English Grammar and Composition, Geography (ancient and modern), Ancient History, and French or German. Some few require also an elementary knowledge of Chemistry or Physics, and Plane Trigonometry; and some, United States History. Greek is in some institutions made optional, with the choice of substituting German.

The curricula of the various universities do not very greatly differ for the undergraduate student; but in a few universities, the power of electing studies is given to the student, with much less restriction than in others. The general practice is for the student to pursue a prescribed course for the first two years; and with the third year to elect such studies as his maturer judgment may regard as likely to be most useful to him. Complete liberty of selection is generally given him in his fourth, or "Senior" year. At Harvard and at the University of Virginia, however, from the outset, complete liberty of choice is permitted. (See HARVARD UNIVERSITY.) At the end of four years, the degree of Bachelor of Arts is conferred, usually with much ceremony, at the "Com-

ancement" (q.v.). This degree (as said before, the degree of Bachelor of Letters, Science, or Philosophy is sometimes given instead of that in Arts) admits the graduate to university studies in those institutions that afford facilities for advanced work. The pursuit of special studies (usually three, as in Germany) under the direction of university professors, followed by the preparation of a dissertation upon some point connected with his major subject, and by a series of examinations, public or private, leads to the higher degree of Doctor of Philosophy (Ph.D.).

In general, the undergraduates of an American university lodge in the college buildings, as at Oxford and Cambridge. They usually arrange for their meals outside the college walls, at eating clubs, boarding-houses, or restaurants. At Harvard (q.v.), board in the Memorial Hall is provided upon payment of a moderate sum per week. At Brown, Clark, Columbia, the University of the City of New York, the University of Pennsylvania, the Johns Hopkins University and a few others, the German plan prevails of leaving the students to find their own lodgings where they please.

The American universities whose origin antedates the Revolution are these: Harvard (1638); William and Mary (1693); Yale (1701); Princeton (1746); University of Pennsylvania (1753); Columbia (1754); Brown (1764); Rutgers (1766); Dartmouth (1769).

The following table, taken from the report of the commissioner of education for 1895-6, gives the statistics of universities and colleges for men and for both sexes in the United States:

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|--------------------|-----------------------|-------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| ALABAMA. | | | | | | |
| 1 | Blountsville..... | Blount College..... | 1890 | Nonsect..... | 8 | 142 |
| 2 | Cullman..... | St. Bernard College..... | 1892 | R. C..... | 19 | 101 |
| 3 | East Lake..... | Howard College..... | 1841 | Bapt..... | 8 | 166 |
| 4 | Greensboro..... | Southern University..... | 1859 | M. E. So..... | 8 | 160 |
| 5 | Lafayette..... | Lafayette College..... | 1885 | Nonsect..... | 5 | 175 |
| 6 | Lineville..... | Lineville College..... | 1890 | Nonsect..... | 7 | 203 |
| 7 | Selma..... | Alabama Baptist Colored University. | 1878 | Bapt..... | 7 | 160 |
| 8 | Spring Hill..... | Spring Hill College..... | 1830 | R. C..... | 20 | 127 |
| 9 | University..... | University of Alabama..... | 1831 | Nonsect..... | 16 | 154 |
| ARIZONA. | | | | | | |
| 10 | Tucson..... | University of Arizona..... | 1891 | Nonsect..... | 22 | 100 |
| ARKANSAS. | | | | | | |
| 11 | Arkadelphia..... | Arkadelphia Methodist College. | 1890 | M. E. So..... | 13 | 285 |
| 12 |do..... | Ouachita Baptist College..... | 1886 | Bapt..... | 7 | 260 |
| 13 | Batesville..... | Arkansas College..... | 1872 | Presb..... | 7 | 72 |
| 14 | Clarksville..... | Arkansas Cumberland College. | 1891 | Cum. Pres..... | 8 | 142 |
| 15 | Conway..... | Hendrix College..... | 1884 | M. E. So..... | 6 | 134 |
| 16 | Fayetteville..... | Arkansas Industrial University. | 1872 | Nonsect..... | 36 | 575 |
| 17 | Little Rock..... | Little Rock University..... | 1883 | M. E..... | 39 | 360 |
| 18 |do..... | Philander Smith College..... | 1877 | M. E..... | 11 | 272 |
| 19 | Mountain Home..... | Mountain Home Baptist College. | 1893 | Bapt..... | 9 | 165 |
| 20 | Searcy..... | Searcy College..... | 1891 | M. E..... | 7 | 110 |
| CALIFORNIA. | | | | | | |
| 21 | Berkeley..... | University of California..... | 1869 | Nonsect..... | 250 | 2,047 |
| 22 | Claremont..... | Pomona College*..... | 1888 | Cong..... | 14 | 219 |
| 23 | College City..... | Pierce Christian College..... | 1875 | Christian..... | 7 | 32 |
| 24 | College Park..... | University of the Pacific..... | 1855 | M. E..... | 30 | 381 |
| 25 | Los Angeles..... | Occidental College..... | 1887 | Presb..... | 5 | 59 |
| 26 |do..... | St. Vincent's College..... | 1885 | R. C..... | 7 | 103 |
| 27 | Oakland..... | California College..... | 1887 | Bapt..... | 11 | 50 |
| 28 |do..... | St. Mary's College*..... | 1863 | R. C..... | 17 | 174 |
| 29 | Pasadena..... | Throop Polytechnic Institute | 1891 | Nonsect..... | 22 | 313 |
| 30 | San Francisco..... | St. Ignatius College..... | 1855 | R. C..... | 17 | 560 |
| 31 | Santa Clara..... | Santa Clara College..... | 1851 | R. C..... | 29 | 253 |
| 32 | Santa Rosa..... | Pacific Methodist College..... | 1861 | M. E. So..... | 8 | 65 |
| 33 | Stanford University.. | Leland Stanford Junior University. | 1891 | Nonsect..... | 78 | 1,069 |
| 34 | University..... | University of Southern California. | 1880 | M. E..... | 60 | 582 |
| 35 | Woodbridge..... | San Joaquin Valley College.... | 1879 | U. B..... | 5 | 36 |

* Statistics of 1894-95.

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|----|-----------------------|--------------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| | COLORADO. | | | | | |
| 36 | Boulder..... | University of Colorado..... | 1877 | Nonsect..... | 69 | 509 |
| 37 | Colorado Springs.... | Colorado College..... | 1874 | Nonsect..... | 32 | 277 |
| 38 | Del Norte..... | Presbyterian College of the Southwest..... | 1884 | Presb..... | 8 | 61 |
| 39 | Denver..... | College of the Sacred Heart.... | 1888 | R. C..... | 10 | 114 |
| 40 | University Park.... | University of Denver..... | 1864 | M. E..... | 85 | 481 |
| | CONNECTICUT. | | | | | |
| 41 | Hartford..... | Trinity College..... | 1824 | P. E..... | 20 | 134 |
| 42 | Middletown..... | Wesleyan University..... | 1831 | M. E..... | 34 | 301 |
| 43 | New Haven..... | Yale University..... | 1701 | Cong..... | 226 | 2,415 |
| | DELAWARE. | | | | | |
| 44 | Newark..... | Delaware College..... | 1834 | Nonsect..... | 10 | 71 |
| | DISTRICT OF COLUMBIA. | | | | | |
| 45 | Washington..... | Catholic University of America | 1889 | R. C..... | 26 | 110 |
| 46 |do..... | Columbian University..... | 1821 | Bapt..... | 149 | 1,036 |
| 47 |do..... | Gallaudet College..... | 1864 | Nonsect..... | 18 | 85 |
| 48 |do..... | Georgetown University..... | 1791 | R. C..... | 94 | 651 |
| 49 |do..... | Gonzaga College..... | 1820 | R. C..... | 13 | 151 |
| 50 |do..... | Howard University..... | 1867 | Nonsect..... | 57 | 584 |
| | FLORIDA. | | | | | |
| 51 | De Land..... | John B. Stetson University.... | 1887 | Bapt..... | 19 | 145 |
| 52 | Lake City..... | Florida State Agricultural College..... | 1884 | Nonsect..... | 18 | 203 |
| 53 | Leesburg..... | Florida Conference College..... | 1886 | M. E. So..... | 10 | 71 |
| 54 | St. Leo..... | St. Leo Military College..... | 1890 | R. C..... | 5 | 35 |
| 55 | Tallahassee..... | Seminary West of the Suwanee River..... | 1857 | Nonsect..... | 6 | 110 |
| 56 | Winter Park..... | Rollins College..... | 1885 | Cong..... | 17 | 196 |
| | GEORGIA. | | | | | |
| 57 | Athens..... | University of Georgia..... | 1801 | Nonsect..... | 37 | 422 |
| 58 | Atlanta..... | Atlanta University..... | 1869 | Nonsect..... | 22 | 265 |
| 59 |do..... | Morris Brown College..... | 1885 | A. M. E..... | 11 | 401 |
| 60 | Bowdon..... | Bowdon College..... | 1856 | Nonsect..... | 4 | 131 |
| 61 | Dahlonega..... | North Georgia Agricultural College..... | 1873 | Nonsect..... | 8 | 176 |
| 62 | Macon..... | Mercer University..... | 1837 | Bapt..... | 16 | 204 |
| 63 | Oxford..... | Emory College..... | 1837 | M. E. So..... | 14 | 304 |
| 64 | South Atlanta..... | Clark University..... | 1868 | R. C..... | 13 | 332 |
| 65 | Wrightsville..... | Nannie Lou Warthen College | 1888 | M. E. So..... | 4 | 146 |
| 66 | Young Harris..... | Young L. G. Harris College.... | 1887 | M. E. So..... | 10 | 348 |
| | IDAHO. | | | | | |
| 67 | Moscow..... | University of Idaho..... | 1892 | Nonsect..... | 16 | 286 |
| | ILLINOIS. | | | | | |
| 68 | Abingdon..... | Hedding College..... | 1855 | M. E..... | 16 | 403 |
| 69 | Bloomington..... | Illinois Wesleyan University.. | 1850 | M. E..... | 34 | 1,114 |
| 70 | Bourbonnais..... | St. Viateur's College..... | 1868 | R. C..... | 35 | 200 |
| 71 | Carlinville..... | Blackburn University..... | 1859 | Presb..... | 7 | 88 |
| 72 | Carthage..... | Carthage College..... | 1872 | Luth..... | 13 | 129 |
| 73 | Champaign..... | University of Illinois..... | 1868 | Nonsect..... | 82 | 855 |
| 74 | Chicago..... | St. Ignatius College..... | 1870 | R. C..... | 24 | 494 |
| 75 |do..... | University of Chicago..... | 1892 | Bapt..... | 180 | 2,100 |
| 76 | Effingham..... | Austin College..... | 1891 | ..... | 11 | 371 |
| 77 | Elmhurst..... | Evangelical Proseminary..... | 1871 | Ger. Ev..... | 8 | 133 |
| 78 | Eureka..... | Eureka College..... | 1855 | Christian..... | 14 | 246 |
| 79 | Evanston..... | Northwestern University..... | 1855 | M. E..... | 243 | 3,016 |
| 80 | Ewing..... | Ewing College..... | 1867 | Bapt..... | 10 | 171 |
| 81 | Fulton..... | Northern Illinois College..... | 1860 | M. E..... | 10 | 105 |
| 82 | Galesburg..... | Knox College..... | 1837 | Nonsect..... | 26 | 672 |
| 83 |do..... | Lombard University..... | 1851 | Univ..... | 15 | 179 |
| 84 | Hoopeston..... | Greer College..... | 1890 | Nonsect..... | 11 | 315 |
| 85 | Jacksonville..... | Illinois College..... | 1829 | Nonsect..... | 15 | 203 |
| 86 | Lake Forest..... | Lake Forest University..... | 1875 | Presb..... | 159 | 2,203 |
| 87 | Lebanon..... | McKendree College..... | 1828 | M. E..... | 11 | 187 |
| 88 | Lincoln..... | Lincoln University..... | 1866 | Cum. Pres..... | 10 | 178 |
| 89 | Monmouth..... | Monmouth College..... | 1853 | Un. Pres..... | 15 | 289 |
| 90 | Naperville..... | Northwestern College..... | 1861 | Ev. Ass'n..... | 20 | 342 |
| 91 | Peru..... | St. Bede College..... | 1891 | R. C..... | 9 | 70 |
| 92 | Quincy..... | Chaddock College..... | 1876 | M. E..... | 13 | 110 |
| 93 |do..... | St. Francis Solanus College*.. | 1860 | R. C..... | 13 | 182 |
| 94 | Rock Island..... | Augustana College..... | 1860 | Luth..... | 27 | 510 |
| 95 | Teutopolis..... | St. Joseph's Diocesan College | 1882 | R. C..... | 12 | 185 |
| 96 | Upper Alton..... | Shurtleff College..... | 1827 | Bapt..... | 21 | 207 |
| 97 | Westfield..... | Westfield College..... | 1865 | U. B..... | 9 | 120 |
| 98 | Wheaton..... | Wheaton College..... | 1860 | Cong..... | 18 | 302 |

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|-------------------|----------------------|------------------------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| INDIAN TERRITORY. | | | | | | |
| 99 | Bacone..... | Indian University..... | 1880 | Bapt..... | 5 | 85 |
| 100 | Muscogee..... | Henry Kendall College..... | 1894 | Presb..... | 9 | 92 |
| INDIANA. | | | | | | |
| 101 | Bloomington..... | Indiana University..... | 1820 | Nonsect..... | 61 | 879 |
| 102 | Crawfordsville..... | Wabash College..... | 1832 | Nonsect..... | 20 | 240 |
| 103 | Fort Wayne..... | Concordia College..... | 1839 | Luth..... | 8 | 159 |
| 104 | Franklin..... | Franklin College..... | 1844 | Bapt..... | 12 | 238 |
| 105 | Greencastle..... | De Pauw University..... | 1837 | M. E..... | 34 | 643 |
| 106 | Hanover..... | Hanover College..... | 1832 | Presb..... | 12 | 141 |
| 107 | Hartsville..... | Hartsville College..... | 1850 | U. B..... | 5 | 60 |
| 108 | Irvington..... | Butler College..... | 1855 | Nonsect..... | 27 | 231 |
| 109 | Merom..... | Union Christian College..... | 1859 | Christian..... | 9 | 228 |
| 110 | Moore's Hill..... | Moore's Hill College*..... | 1856 | M. E..... | 10 | 228 |
| 111 | Notre Dame..... | University of Notre Dame*..... | 1842 | R. C..... | 94 | 576 |
| 112 | Richmond..... | Earlham College..... | 1847 | Friends..... | 18 | 256 |
| 113 | Ridgeville..... | Ridgeville College..... | 1867 | Cong..... | 6 | 140 |
| 114 | St. Meinrad..... | St. Meinrad's College..... | 1857 | R. C..... | 13 | 110 |
| 115 | Upland..... | Taylor University..... | 1847 | M. E..... | 15 | 207 |
| IOWA. | | | | | | |
| 116 | Cedar Rapids..... | Coe College..... | 1881 | Presb..... | 10 | 127 |
| 117 | Charles City..... | Charles City College..... | 1891 | M. E..... | 7 | 145 |
| 118 | Clinton..... | Wartburg College..... | 1868 | Luth..... | 9 | 69 |
| 119 | College Springs..... | Amity College..... | 1855 | Nonsect..... | 12 | 245 |
| 120 | Decorah..... | Luther College..... | 1861 | Luth..... | 13 | 200 |
| 121 | Des Moines..... | Des Moines College..... | 1865 | Bapt..... | 12 | 173 |
| 122 | do..... | Drake University..... | 1880 | Christian..... | 51 | 820 |
| 123 | Fairfield..... | Parsons College..... | 1876 | Presb..... | 11 | 150 |
| 124 | Fayette..... | Upper Iowa University..... | 1857 | M. E..... | 22 | 417 |
| 125 | Grinnell..... | Iowa College..... | 1847 | Cong..... | 32 | 476 |
| 126 | Hopkinton..... | Lenox College*..... | 1858 | Presb..... | 10 | 120 |
| 127 | Indianola..... | Simpson College..... | 1867 | M. E..... | 17 | 480 |
| 128 | Iowa City..... | State University of Iowa..... | 1855 | Nonsect..... | 106 | 1,307 |
| 129 | Mount Pleasant..... | German College..... | 1873 | M. E..... | 1 | 25 |
| 130 | do..... | Iowa Wesleyan University..... | 1844 | M. E..... | 16 | 340 |
| 131 | Mount Vernon..... | Cornell College..... | 1857 | M. E..... | 31 | 572 |
| 132 | Oskaloosa..... | Oskaloosa College*..... | 1862 | Christian..... | 5 | 76 |
| 133 | do..... | Penn College..... | 1872 | Friends..... | 13 | 255 |
| 134 | Pella..... | Central University of Iowa..... | 1853 | Bapt..... | 14 | 158 |
| 135 | Sioux City..... | Morningside College..... | 1890 | M. E..... | 12 | 246 |
| 136 | Storm Lake..... | Buena Vista College..... | 1891 | Presb..... | 7 | 114 |
| 137 | Tabor..... | Tabor College..... | 1866 | Cong..... | 16 | 167 |
| 138 | Toledo..... | Western College..... | 1856 | U. B..... | 13 | 155 |
| KANSAS. | | | | | | |
| 139 | Atchison..... | Midland College..... | 1887 | Luth..... | 11 | 120 |
| 140 | do..... | St. Benedict's College..... | 1858 | R. C..... | 27 | 163 |
| 141 | Baldwin..... | Baker University..... | 1858 | M. E..... | 22 | 580 |
| 142 | Dodge City..... | Soule College..... | 1894 | M. E..... | 14 | 166 |
| 143 | Emporia..... | College of Emporia..... | 1883 | Presb..... | 10 | 120 |
| 144 | Highland..... | Highland University..... | 1856 | Presb..... | 9 | 40 |
| 145 | Holton..... | Campbell University..... | 1882 | Nonsect..... | 17 | 665 |
| 146 | Lawrence..... | University of Kansas..... | 1866 | Nonsect..... | 54 | 895 |
| 147 | Lecompton..... | Lane University..... | 1865 | U. B..... | 8 | 157 |
| 148 | Lindsborg..... | Bethany College..... | 1881 | Luth..... | 23 | 437 |
| 149 | Ottawa..... | Ottawa University..... | 1865 | Bapt..... | 13 | 450 |
| 150 | St. Mary's..... | St. Mary's College..... | 1869 | R. C..... | 25 | 221 |
| 151 | Salina..... | Kansas Wesleyan University..... | 1886 | M. E..... | 15 | 98 |
| 152 | Sterling..... | Cooper Memorial College..... | 1887 | U. Presb..... | 8 | 113 |
| 153 | Topeka..... | Washburn College..... | 1865 | Cong..... | 14 | 216 |
| 154 | Wichita..... | Fairmount College..... | 1892 | Cong..... | 13 | 84 |
| 155 | Winfield..... | St. John's Lutheran College..... | 1893 | Luth..... | 5 | 40 |
| 156 | do..... | Southwest Kansas College..... | 1886 | M. E..... | 16 | 248 |
| KENTUCKY. | | | | | | |
| 157 | Barbourville..... | Union College..... | 1888 | M. E..... | 6 | 105 |
| 158 | Berea..... | Berea College..... | 1855 | Nonsect..... | 31 | 476 |
| 159 | Bowling Green..... | Orden College..... | 1877 | Nonsect..... | 6 | 76 |
| 160 | Danville..... | Centre College..... | 1819 | Presb..... | 15 | 265 |
| 161 | Georgetown..... | Georgetown College..... | 1829 | Bapt..... | 18 | 399 |
| 162 | Glasgow..... | Liberty College..... | 1875 | Bapt..... | 5 | 110 |
| 163 | Hopkinsville..... | South Kentucky College*..... | 1849 | Christian..... | 12 | 160 |
| 164 | Lexington..... | Agricultural and Mechanical College of Kentucky..... | 1866 | Nonsect..... | 18 | 346 |
| 165 | do..... | Kentucky University..... | 1836 | Christian..... | 24 | 757 |
| 166 | Richmond..... | Central University..... | 1874 | Presb..... | 30 | 807 |
| 167 | Russellville..... | Bethel College..... | 1854 | Bapt..... | 6 | 163 |
| 168 | St. Mary's..... | St. Mary's College..... | 1821 | R. C..... | 11 | 115 |
| 169 | Winchester..... | Kentucky Wesleyan College..... | 1860 | M. E. So..... | 8 | 128 |

* Statistics of 1894-95.

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|----------------|-----------------------|---------------------------------------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| LOUISIANA. | | | | | | |
| 170 | Baton Rouge..... | Louisiana State University and Agricultural and Mechanical College. | 1860 | Nonsect..... | 22 | 266 |
| 171 | Convent..... | Jefferson College..... | 1860 | R. C..... | 15 | 81 |
| 172 | Jackson..... | Centenary College of Louisiana | 1825 | M. E. So..... | 7 | 94 |
| 173 | Keatchie..... | Keatchie College..... | 1856 | Bapt..... | 10 | 150 |
| 174 | New Orleans..... | College of the Immaculate Conception. | 1847 | R. C..... | 23 | 333 |
| 175 | ...do..... | Leland University..... | 1870 | Nonsect..... | 18 | 495 |
| 176 | ...do..... | New Orleans University..... | 1873 | M. E..... | 29 | 553 |
| 177 | ...do..... | Straight University..... | 1869 | Cong..... | 13 | 132 |
| 178 | ...do..... | Tulane University..... | 1834 | Nonsect..... | 70 | 959 |
| MAINE. | | | | | | |
| 179 | Brunswick..... | Bowdoin College..... | 1802 | Cong..... | 30 | 342 |
| 180 | Lewiston..... | Bates College..... | 1863 | Bapt..... | 17 | 237 |
| 181 | Waterville..... | Colby University..... | 1818 | Bapt..... | 15 | 207 |
| MARYLAND. | | | | | | |
| 182 | Annapolis..... | St. John's College..... | 1789 | Nonsect..... | 14 | 173 |
| 183 | Baltimore..... | Johns Hopkins University..... | 1876 | Nonsect..... | 106 | 596 |
| 184 | ...do..... | Loyola College..... | 1852 | R. C..... | 13 | 200 |
| 185 | ...do..... | Morgan College..... | 1876 | M. E..... | 7 | 34 |
| 186 | Chestertown..... | Washington College..... | 1782 | Nonsect..... | 7 | 98 |
| 187 | Ellicott City..... | Rock Hill College..... | 1857 | R. C..... | 14 | 124 |
| 188 | ...do..... | St. Charles College..... | 1848 | R. C..... | 20 | 230 |
| 189 | Mount St. Mary's..... | Mount St. Mary's College..... | 1808 | R. C..... | 15 | 215 |
| 190 | New Windsor..... | New Windsor College..... | 1843 | Presb..... | 9 | 68 |
| 191 | Westminster..... | Western Maryland College..... | 1869 | M. P..... | 19 | 272 |
| MASSACHUSETTS. | | | | | | |
| 192 | Amherst..... | Amherst College..... | 1821 | Cong..... | 33 | 451 |
| 193 | Boston..... | Boston College..... | 1863 | R. C..... | 18 | 419 |
| 194 | ...do..... | Boston University..... | 1871 | M. E..... | 114 | 1,320 |
| 195 | Cambridge..... | Harvard University..... | 1638 | Nonsect..... | 366 | 3,600 |
| 196 | Springfield..... | French-American College..... | 1885 | Cong..... | 8 | 80 |
| 197 | Tufts College..... | Tufts College..... | 1855 | Univ..... | 86 | 484 |
| 198 | Williamstown..... | Williams College..... | 1793 | Nonsect..... | 28 | 355 |
| 199 | Worcester..... | Clark University..... | 1889 | Nonsect..... | 11 | 42 |
| 200 | ...do..... | College of the Holy Cross..... | 1843 | R. C..... | 23 | 251 |
| MICHIGAN. | | | | | | |
| 201 | Adrian..... | Adrian College..... | 1859 | M. P..... | 20 | 278 |
| 202 | Albion..... | Albion College..... | 1843 | M. E..... | 32 | 589 |
| 203 | Alma..... | Alma College..... | 1887 | Presb..... | 17 | 234 |
| 204 | Ann Arbor..... | University of Michigan..... | 1837 | Nonsect..... | 164 | 2,917 |
| 205 | Battle Creek..... | Battle Creek College..... | 1874 | 7 Day Ad..... | 22 | 716 |
| 206 | Benzonia..... | Benzonia College..... | 1890 | Cong..... | 16 | 128 |
| 207 | Detroit..... | Detroit College..... | 1877 | R. C..... | 15 | 288 |
| 208 | Hillsdale..... | Hillsdale College..... | 1855 | Free Bapt..... | 22 | 394 |
| 209 | Holland..... | Hope College..... | 1865 | Ref..... | 15 | 271 |
| 210 | Kalamazoo..... | Kalamazoo College..... | 1855 | Bapt..... | 14 | 187 |
| 211 | Olivet..... | Olivet College..... | 1859 | Cong..... | 24 | 397 |
| MINNESOTA. | | | | | | |
| 212 | Collegeville..... | St. John's University..... | 1867 | R. C..... | 30 | 203 |
| 213 | Excelsior..... | Northwestern Christian College. | 1890 | Christian..... | 11 | 101 |
| 214 | Hamline..... | Hamline University..... | 1854 | M. E..... | 38 | 433 |
| 215 | Minneapolis..... | Augsburg Seminary..... | 1869 | Luth..... | 8 | 165 |
| 216 | ...do..... | University of Minnesota..... | 1868 | Nonsect..... | 178 | 2,467 |
| 217 | Northfield..... | Carleton College..... | 1867 | Cong..... | 24 | 259 |
| 218 | ...do..... | St. Olaf College..... | 1875 | Luth..... | 10 | 122 |
| 219 | St. Paul..... | Macalester College..... | 1885 | Presb..... | 10 | 120 |
| 220 | St. Peter..... | Gustavus Adolphus College.. | 1876 | Luth..... | 17 | 238 |
| 221 | Winnebago City..... | Parker College..... | 1888 | Free Bapt..... | 9 | 153 |
| MISSISSIPPI. | | | | | | |
| 222 | Clinton..... | Mississippi College..... | 1852 | Bapt..... | 10 | 242 |
| 223 | Daleville..... | Cooper-Huddleston College.. | 1865 | Nonsect..... | 6 | 128 |
| 224 | Holly Springs..... | Rust University..... | 1868 | M. E..... | 9 | 228 |
| 225 | Jackson..... | Millsaps College..... | 1892 | M. E..... | 9 | 164 |
| 226 | University..... | University of Mississippi.... | 1848 | Nonsect..... | 20 | 271 |
| MISSOURI. | | | | | | |
| 227 | Albany..... | Central Christian College.... | 1892 | Christian..... | 8 | 100 |
| 228 | ...do..... | Northwest Missouri College.. | 1892 | M. E. So..... | 8 | 145 |
| 229 | Bolivar..... | Southwest Baptist College.... | 1878 | Bapt..... | 8 | 157 |
| 230 | Bowling Green..... | Pike College..... | 1882 | Nonsect..... | 7 | 165 |
| 231 | Cameron..... | Missouri Wesleyan College.... | 1883 | M. E..... | 12 | 250 |
| 232 | Canton..... | Christian University..... | 1855 | Christian..... | 11 | 110 |
| 233 | Cape Girardeau..... | St. Vincent's College..... | 1843 | R. C..... | 4 | 20 |
| 234 | Columbia..... | University of the State of Missouri. | 1842 | Nonsect..... | 59 | 753 |

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|-------------------|-----------------------|--------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| MISSOURI.—Cont'd. | | | | | | |
| 235 | Edinburg..... | Grand River Christian Union College. | 1850 | Christ. U..... | 5 | 102 |
| 236 | Fayette..... | Central College..... | 1857 | M. E. So..... | 13 | 189 |
| 237 | Fulton..... | Westminster College..... | 1853 | Presb..... | 10 | 110 |
| 238 | Glasgow..... | Pritchett School Institute... | 1866 | Nonsect..... | 11 | 105 |
| 239 | Greenfield..... | Ozark College..... | 1882 | Cum. Pres..... | 6 | 85 |
| 240 | La Grange..... | La Grange College..... | 1858 | Bapt..... | 14 | 76 |
| 241 | Lawson..... | Lawson Presbyterian College.* | 1891 | Pres..... | 5 | 95 |
| 242 | Liberty..... | William Jewell College..... | 1849 | Bapt..... | 17 | 344 |
| 243 | Marshall..... | Missouri Valley College..... | 1889 | Cum. Pres..... | 13 | 275 |
| 244 | Morrisville..... | Morrisville College..... | 1873 | M. E. So..... | 8 | 109 |
| 245 | Neosho..... | Scarritt Collegiate Institute.. | 1888 | M. E. So..... | 9 | 166 |
| 246 | Parkville..... | Park College..... | 1875 | Pres..... | 21 | 356 |
| 247 | St. Charles..... | St. Charles College..... | 1837 | M. E. So..... | 6 | 50 |
| 248 | St. Louis..... | Christian Brothers College... | 1851 | R. C..... | 24 | 420 |
| 249 |do..... | St. Louis University..... | 1829 | R. C..... | 19 | 313 |
| 250 |do..... | Washington University..... | 1859 | Nonsect..... | 175 | 1,567 |
| 251 | Springfield..... | Drury College..... | 1873 | Cong..... | 16 | 291 |
| 252 | Tarkio..... | Tarkio College..... | 1883 | U. Pres..... | 18 | 254 |
| 253 | Trenton..... | Avalon College..... | 1869 | U. B..... | 10 | 169 |
| 254 | Warrenton..... | Central Wesleyan College.... | 1864 | M. E..... | 14 | 265 |
| MONTANA. | | | | | | |
| 255 | Deer Lodge..... | College of Montana..... | 1878 | Presb..... | 9 | 72 |
| 256 | Helena..... | Montana Wesleyan University. | 1890 | M. E..... | 9 | 143 |
| 257 | Missoula..... | University of Montana..... | 1895 | Nonsect..... | 8 | 135 |
| NEBRASKA. | | | | | | |
| 258 | Bellevue..... | University of Omaha..... | 1880 | Presb..... | 51 | 268 |
| 259 | Bethany..... | Cotner University..... | 1888 | Christian..... | 29 | 227 |
| 260 | College View..... | Union College..... | 1891 | 7-Day Ad..... | 21 | 312 |
| 261 | Crete..... | Doane College..... | 1872 | Cong..... | 10 | 215 |
| 262 | Fairfield..... | Fairfield College..... | 1884 | Christian..... | 6 | 81 |
| 263 | Lincoln..... | University of Nebraska..... | 1871 | Nonsect..... | 59 | 1,389 |
| 264 | Neligh..... | Gates College..... | 1882 | Cong..... | 12 | 124 |
| 265 | Omaha..... | Creighton University..... | 1878 | R. C..... | 46 | 232 |
| 266 | University Place | Nebraska Wesleyan University. | 1888 | M. E..... | 14 | 475 |
| 267 | York..... | York College..... | 1894 | U. B..... | 10 | 165 |
| NEVADA. | | | | | | |
| 268 | Reno..... | State University of Nevada.. | 1886 | Nonsect..... | 18 | 334 |
| NEW HAMPSHIRE. | | | | | | |
| 269 | Hanover..... | Dartmouth College..... | 1770 | Cong..... | 46 | 556 |
| NEW JERSEY. | | | | | | |
| 270 | Newark..... | St. Benedict's College..... | 1869 | R. C..... | 6 | 89 |
| 271 | New Brunswick..... | Rutgers College..... | 1766 | Ref..... | 37 | 330 |
| 272 | Princeton..... | Princeton University..... | 1746 | Nonsect..... | 78 | 1,088 |
| 273 | South Orange..... | Seton Hall College..... | 1856 | R. C..... | 13 | 107 |
| NEW MEXICO. | | | | | | |
| 274 | Albuquerque..... | University of New Mexico.... | 1892 | Nonsect..... | 8 | 79 |
| NEW YORK. | | | | | | |
| 275 | Alfred..... | Alfred University..... | 1836 | 7-Day Bap..... | 22 | 207 |
| 276 | Allegany..... | St. Bonaventure's College.... | 1859 | R. C..... | 19 | 196 |
| 277 | Amundale..... | St. Stephen's College..... | 1860 | P. E..... | 8 | 69 |
| 278 | Brooklyn..... | Polytechnic Institute of Brooklyn. | 1890 | Nonsect..... | 51 | 723 |
| 279 |do..... | St. Francis College..... | 1859 | R. C..... | 26 | 260 |
| 280 |do..... | St. John's College..... | 1870 | R. C..... | 13 | 197 |
| 281 | Buffalo..... | Canisius College..... | 1870 | R. C..... | 29 | 241 |
| 282 | Canton..... | St. Lawrence University..... | 1858 | Univ..... | 15 | 137 |
| 283 | Clinton..... | Hamilton College..... | 1812 | Nonsect..... | 18 | 150 |
| 284 | Geneva..... | Hobart College..... | 1822 | P. E..... | 21 | 89 |
| 285 | Hamilton..... | Colgate University..... | 1819 | Bapt..... | 38 | 325 |
| 286 | Ithaca..... | Cornell University..... | 1868 | Nonsect..... | 167 | 1,702 |
| 287 | New York..... | College of St. Francis Xavier. | 1847 | R. C..... | 30 | 614 |
| 288 |do..... | College of the City of New York. | 1849 | Nonsect..... | 52 | 1,426 |
| 289 |do..... | Columbia University..... | 1754 | Nonsect..... | 275 | 1,871 |
| 290 |do..... | Manhattan College..... | 1863 | R. C..... | 27 | 693 |
| 291 |do..... | New York University..... | 1831 | Nonsect..... | 116 | 1,257 |
| 292 |do..... | St. John's College..... | 1841 | R. C..... | 27 | 217 |
| 293 | Niagara University... | Niagara University..... | 1856 | R. C..... | 47 | 260 |
| 294 | Rochester..... | University of Rochester..... | 1850 | Bapt..... | 15 | 192 |
| 295 | Schenectady..... | Union College..... | 1795 | Nonsect..... | 29 | 253 |
| 296 | Syracuse..... | Syracuse University..... | 1871 | M. E..... | 112 | 989 |

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|-----------------|-------------------------|----------------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| NORTH CAROLINA. | | | | | | |
| 297 | Chapel Hill..... | University of North Carolina..... | 1795 | Nonsect..... | 39 | 540 |
| 298 | Charlotte..... | Biddle University..... | 1867 | Presb..... | 12 | 249 |
| 299 | Davidson..... | Davidson College..... | 1837 | Presb..... | 11 | 186 |
| 300 | Durham..... | Trinity College..... | 1851 | M. E. So..... | 10 | 130 |
| 301 | Elon College..... | Elon College..... | 1890 | Christian..... | 12 | 135 |
| 302 | Guilford College..... | Guilford College..... | 1837 | Friends..... | 11 | 168 |
| 303 | Hickory..... | Lenoir College..... | 1891 | Luth..... | 7 | 107 |
| 304 | Mars Hill..... | Mars Hill College..... | 1856 | Bapt..... | 6 | 305 |
| 305 | Mount Pleasant..... | North Carolina College..... | 1859 | Luth..... | 5 | 71 |
| 306 | Newton..... | Catawba College..... | 1851 | Ref..... | 9 | 160 |
| 307 | Raleigh..... | Shaw University..... | 1865 | Bapt..... | 24 | 327 |
| 308 | Rutherford College..... | Rutherford College..... | 1853 | Nonsect..... | 7 | 106 |
| 309 | Salisbury..... | Livingstone College..... | 1882 | A. M. E. Z..... | 15 | 157 |
| 310 | Wake Forest..... | Wake Forest College..... | 1884 | Bapt..... | 16 | 200 |
| 311 | Weaverville..... | Weaverville College..... | 1873 | M. E. So..... | 5 | 225 |
| NORTH DAKOTA. | | | | | | |
| 312 | Fargo..... | Fargo College..... | 1887 | Cong..... | 12 | 132 |
| 313 | University..... | University of North Dakota..... | 1884 | Nonsect..... | 11 | 290 |
| 314 | Wahpeton..... | Red River Valley University..... | 1892 | M. E..... | 6 | 104 |
| OHIO. | | | | | | |
| 315 | Akron..... | Buchtel College..... | 1872 | Univ..... | 14 | 197 |
| 316 | Alliance..... | Mount Union College..... | 1846 | M. E..... | 18 | 462 |
| 317 | Ashland..... | Ashland University *..... | 1879 | U. B..... | 7 | 72 |
| 318 | Athens..... | Ohio University..... | 1809 | Nonsect..... | 21 | 285 |
| 319 | Berea..... | Baldwin University..... | 1846 | M. E..... | 15 | 152 |
| 320 | do..... | German Wallace College..... | 1894 | M. E..... | 7 | 103 |
| 321 | Cedarville..... | Cedarville College..... | 1894 | Ref. Presb..... | 7 | 69 |
| 322 | Cincinnati..... | St. Joseph's College..... | 1872 | R. C..... | 10 | 225 |
| 323 | do..... | St. Xavier College..... | 1840 | R. C..... | 21 | 394 |
| 324 | do..... | University of Cincinnati..... | 1873 | Nonsect..... | 23 | 286 |
| 325 | Cleveland..... | Calvin College *..... | 1883 | Ref..... | 4 | 32 |
| 326 | do..... | St. Ignatius College..... | 1886 | R. C..... | 14 | 231 |
| 327 | do..... | Western Reserve University..... | 1826 | Nonsect..... | 95 | 512 |
| 328 | Columbus..... | Capital University..... | 1850 | Luth..... | 9 | 141 |
| 329 | do..... | Ohio State University..... | 1870 | Nonsect..... | 76 | 909 |
| 330 | Defiance..... | Defiance College..... | 1884 | Nonsect..... | 8 | 24 |
| 331 | Delaware..... | Ohio Wesleyan University..... | 1844 | M. E..... | 92 | 1,401 |
| 332 | Findlay..... | Findlay College..... | 1886 | Ch. of God..... | 15 | 303 |
| 333 | Gambier..... | Kenyon College..... | 1826 | P. E..... | 18 | 175 |
| 334 | Granville..... | Denison University..... | 1831 | Bapt..... | 18 | 380 |
| 335 | Hiram..... | Hiram College..... | 1850 | Christian..... | 14 | 354 |
| 336 | Lima..... | Lima College..... | 1893 | Luth..... | 11 | 236 |
| 337 | Marietta..... | Marietta College..... | 1835 | Nonsect..... | 42 | 248 |
| 338 | New Athens..... | Franklin College..... | 1825 | Nonsect..... | 11 | 106 |
| 339 | New Concord..... | Muskingum College..... | 1837 | U. Presb..... | 14 | 186 |
| 340 | Oberlin..... | Oberlin College..... | 1833 | Nonsect..... | 88 | 1,411 |
| 341 | Oxford..... | Miami University..... | 1824 | Nonsect..... | 11 | 129 |
| 342 | Richmond..... | Richmond College..... | 1835 | Nonsect..... | 9 | 129 |
| 343 | Rio Grande..... | Rio Grande College..... | 1876 | Free Bapt..... | 6 | 56 |
| 344 | Scio..... | Scio College..... | 1866 | M. E..... | 17 | 477 |
| 345 | Springfield..... | Wittenberg College..... | 1845 | Luth..... | 20 | 360 |
| 346 | Tiffin..... | Heidelberg University..... | 1850 | Ref..... | 19 | 272 |
| 347 | Westerville..... | Otterbein University..... | 1847 | U. B..... | 16 | 270 |
| 348 | Wilberforce..... | Wilberforce University *..... | 1855 | A. M. E..... | 18 | 305 |
| 349 | Wilmington..... | Wilmington College..... | 1870 | Friends..... | 8 | 115 |
| 350 | Wooster..... | University of Wooster..... | 1870 | Presb..... | 64 | 778 |
| 351 | Yellow Springs..... | Antioch College..... | 1852 | Nonsect..... | 17 | 214 |
| OKLAHOMA. | | | | | | |
| 352 | Norman..... | University of Oklahoma..... | 1892 | Nonsect..... | 7 | 148 |
| OREGON. | | | | | | |
| 353 | Eugene..... | University of Oregon..... | 1876 | Nonsect..... | 32 | 495 |
| 354 | Forest Grove..... | Pacific University..... | 1848 | Cong..... | 14 | 200 |
| 355 | Lafayette..... | Lafayette Seminary..... | 1889 | U. Evang..... | 6 | 52 |
| 356 | McMinnville..... | McMinnville College..... | 1859 | Bapt..... | 5 | 83 |
| 357 | Newberg..... | Pacific College..... | 1891 | Friends..... | 7 | 155 |
| 358 | Philomath..... | Philomath College..... | 1867 | U. B..... | 4 | 81 |
| 359 | Salem..... | Willamette University..... | 1844 | M. E..... | 51 | 737 |
| 360 | University Park..... | Portland University..... | 1891 | M. E..... | 22 | 339 |
| PENNSYLVANIA. | | | | | | |
| 361 | Allegheny..... | Western University of Penn- sylvania..... | 1819 | Nonsect..... | 88 | 583 |
| 362 | Allentown..... | Muhlenberg College..... | 1867 | Luth..... | 12 | 160 |
| 363 | Annville..... | Lebanon Valley College..... | 1866 | U. B..... | 11 | 140 |
| 364 | Beatty..... | St. Vincent College..... | 1846 | R. C..... | 21 | 315 |
| 365 | Beaver Falls..... | Geneva College..... | 1848 | Ref. Presb..... | 12 | 226 |
| 366 | Bethlehem..... | Moravian College..... | 1807 | Moravian..... | 5 | 88 |
| 367 | Carlisle..... | Dickinson College..... | 1783 | M. E..... | 27 | 430 |

* Statistics of 1894-95.

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|-----------------|------------------------|-----------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| PENN. — Cont'd. | | | | | | |
| 368 | Chester | Pennsylvania Military College | 1862 | Nonsect. | 15 | 103 |
| 369 | Collegeville | Ursinus College | 1870 | Ref. | 21 | 198 |
| 370 | Easton | Lafayette College | 1832 | Presb. | 28 | 308 |
| 371 | Gettysburg | Pennsylvania College | 1832 | Luth. | 15 | 227 |
| 372 | Greenville | Thiel College | 1871 | Luth. | 8 | 123 |
| 373 | Grove City | Grove City College | 1884 | Nonsect. | 19 | 574 |
| 374 | Haverford | Haverford College | 1833 | Friends | 17 | 99 |
| 375 | Jefferson | Monongahela College | 1867 | Bapt. | 7 | 34 |
| 376 | Lancaster | Franklin and Marshall College. | 1836 | Ref. | 25 | 350 |
| 377 | Lewisburg | Bucknell University | 1846 | Bapt. | 28 | 431 |
| 378 | Lincoln University | Lincoln University | 1854 | Presb. | 11 | 170 |
| 379 | Loretto | St. Francis College* | 1850 | R. C. | 12 | 221 |
| 380 | Meadville | Allegheny College | 1817 | M. E. | 20 | 315 |
| 381 | New Berlin | Central Pennsylvania College. | 1855 | U. Evang. | 10 | 82 |
| 382 | New Wilmington | Westminster College | 1852 | U. Presb. | 12 | 279 |
| 383 | Philadelphia | Central High School | 1838 | Nonsect. | 36 | 1,197 |
| 384 | do. | La Salle College | 1867 | R. C. | 16 | 221 |
| 385 | do. | University of Pennsylvania | 1740 | Nonsect. | 251 | 2,652 |
| 386 | Pittsburg | Duquesne College | 1891 | Nonsect. | 12 | 226 |
| 387 | do. | Holy Ghost College | 1878 | R. C. | 18 | 200 |
| 388 | Selinsgrove | Susquehanna University | ..... | Luth. | 13 | 142 |
| 388 | South Bethlehem | Lehigh University | 1866 | Nonsect. | 38 | 415 |
| 390 | State College | Pennsylvania State College | 1859 | Nonsect. | 42 | 338 |
| 391 | Swarthmore | Swarthmore College | 1869 | Friends | 23 | 182 |
| 392 | Villanova | Villanova College | 1843 | R. C. | 14 | 136 |
| 393 | Volant | Volant College* | 1889 | Nonsect. | 7 | 287 |
| 394 | Washington | Washington and Jefferson College. | 1802 | Presb. | 16 | 306 |
| RHODE ISLAND. | | | | | | |
| 395 | Providence | Brown University | 1764 | Bapt. | 75 | 859 |
| SOUTH CAROLINA. | | | | | | |
| 396 | Charleston | College of Charleston | 1785 | Nonsect. | 6 | 36 |
| 397 | Clinton | Presbyterian College of South Carolina. | 1880 | Presb. | 6 | 87 |
| 398 | Columbia | Allen University | 1881 | A. M. E. | 6 | 253 |
| 399 | do. | South Carolina College | 1805 | Nonsect. | 12 | 185 |
| 400 | Due West | Erskine College | 1839 | A. R. Pres. | 7 | 120 |
| 401 | Greenville | Furman University | 1852 | Bapt. | 10 | 144 |
| 402 | Newberry | Newberry College | 1859 | Luth. | 8 | 101 |
| 403 | Orangeburg | Clafin University | 1869 | Nonsect. | 12 | 137 |
| 404 | Spartanburg | Wofford College | 1854 | M. E. So. | 9 | 197 |
| SOUTH DAKOTA. | | | | | | |
| 405 | East Pierre | Pierre University | 1883 | Presb. | 7 | 76 |
| 406 | Hot Springs | Black Hills College | 1890 | M. E. | 8 | 105 |
| 407 | Mitchell | Dakota University | 1885 | M. E. | 15 | 94 |
| 408 | Redfield | Redfield College* | 1887 | Cong. | 10 | 94 |
| 409 | Vermilion | University of South Dakota | 1882 | Nonsect. | 14 | 295 |
| 410 | Yankton | Yankton College | 1882 | Cong. | 14 | 231 |
| TENNESSEE. | | | | | | |
| 411 | Athens and Chattanooga | U. S. Grant University* | 1867 | M. E. | 60 | 409 |
| 412 | Bristol | King College | 1868 | Presb. | 5 | 85 |
| 413 | Clarksville | Southwestern Presbyterian University. | 1805 | Presb. | 11 | 145 |
| 414 | Harriman | American Temperance University. | 1892 | Nonsect. | 20 | 355 |
| 415 | Hiwassee College | Hiwassee College | 1849 | M. E. So. | 3 | 50 |
| 416 | Jackson | Southwestern Baptist University. | 1847 | Bapt. | 11 | 266 |
| 417 | Knoxville | Knoxville College | 1875 | U. Presb. | 21 | 125 |
| 418 | do. | University of Tennessee | 1794 | None | 62 | 517 |
| 419 | Lebanon | Cumberland University | 1842 | Cum. Pres. | 19 | 324 |
| 420 | McKenzie | Bethel College | 1850 | Cum. Pres. | 8 | 157 |
| 421 | Maryville | Maryville College | 1819 | Presb. | 15 | 446 |
| 422 | Memphis | Christian Brothers College | 1871 | R. C. | 14 | 145 |
| 423 | Milligan | Milligan College | 1882 | Christian | 12 | 176 |
| 424 | Mossy Creek | Carson and Newman College | 1851 | Bapt. | 9 | 241 |
| 425 | Nashville | Central Tennessee College | 1866 | M. E. | 34 | 292 |
| 426 | do. | Fisk University | 1866 | Cong. | 30 | 403 |
| 427 | do. | Roger Williams University | 1864 | Bapt. | 11 | 227 |
| 428 | do. | University of Nashville | 1785 | Nonsect. | 69 | 1,439 |
| 429 | do. | Vanderbilt University | 1875 | M. E. So. | 84 | 656 |
| 430 | Sewanee | University of the South | 1868 | P. E. | 29 | 294 |
| 431 | Spencer | Burritt College | 1848 | Christian | 9 | 178 |
| 432 | Sweetwater | Sweetwater College | 1874 | Nonsect. | 6 | 105 |
| 433 | Tusculum | Greeneville and Tusculum College. | 1794 | Presb. | 7 | 160 |
| 434 | Washington College | Washington College | 1795 | Presb. | 8 | 117 |

* Statistics of 1894-95.

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|-----|----------------------|-------------------------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| | TEXAS. | | | | | |
| 435 | Austin..... | St. Edward's College..... | 1881 | R. C..... | 18 | 150 |
| 436 |do..... | University of Texas..... | 1883 | Nonsect..... | 49 | 736 |
| 437 | Brownwood..... | Howard Payne College..... | 1890 | Bapt..... | 11 | 176 |
| 438 | Campbell..... | Henry College..... | 1892 | Nonsect..... | 12 | 195 |
| 439 | Fort Worth..... | Fort Worth University..... | 1881 | M. E..... | 31 | 294 |
| 440 | Galveston..... | St. Mary's University..... | 1884 | R. C..... | 8 | 120 |
| 441 | Georgetown..... | Southwestern University..... | 1873 | M. E. So..... | 19 | 473 |
| 442 | Marshall..... | Wiley University..... | 1873 | M. E..... | 5 | 19 |
| 443 | San Antonio..... | St. Louis College..... | 1894 | R. C..... | 14 | 120 |
| 444 | Sherman..... | Austin College..... | 1850 | Presb..... | 8 | 123 |
| 445 | Tehuacana..... | Trinity University*..... | 1869 | C. Presb..... | 15 | 301 |
| 446 | Waco..... | Add-Ran Christian University. | 1873 | Christian..... | 14 | 164 |
| 447 |do..... | Baylor University..... | 1845 | Bapt..... | 21 | 552 |
| 448 |do..... | Paul Quinn College..... | 1881 | A. M. E..... | 5 | 108 |
| | UTAH. | | | | | |
| 449 | Logan..... | Brigham Young College..... | 1878 | L. D. S..... | 14 | 314 |
| 450 | Salt Lake City..... | University of Utah..... | 1850 | Nonsect..... | 32 | 520 |
| | VERMONT. | | | | | |
| 451 | Burlington..... | University of Vermont and State Agricultural College. | 1800 | Nonsect..... | 48 | 480 |
| 452 | Middlebury..... | Middlebury College*..... | 1800 | Nonsect..... | 10 | 105 |
| | VIRGINIA. | | | | | |
| 453 | Ashland..... | Randolph-Macon College.... | 1832 | M. E. So..... | 43 | 489 |
| 454 | Bridgewater..... | Bridgewater College..... | 1832 | Bapt..... | 8 | 150 |
| 455 | Charlottesville..... | University of Virginia..... | 1825 | Nonsect..... | 47 | 527 |
| 456 | Emory..... | Emory and Henry College.... | 1838 | M. E. So..... | 9 | 108 |
| 457 | Fredericksburg..... | Fredericksburg College..... | 1893 | Presb..... | 17 | 195 |
| 458 | Hampden Sidney..... | Hampden Sidney College.... | 1776 | Nonsect..... | 8 | 93 |
| 459 | Lexington..... | Washington and Lee University. | 1749 | Nonsect..... | 17 | 223 |
| 460 | Richmond..... | Richmond College..... | 1832 | Bapt..... | 16 | 215 |
| 461 | Salem..... | Roanoke College..... | 1853 | Luth..... | 14 | 168 |
| 462 | Williamsburg..... | College of William and Mary. | 1693 | Nonsect..... | 11 | 183 |
| | WASHINGTON. | | | | | |
| 463 | Burton..... | Vashon College..... | 1892 | Nonsect..... | 10 | 137 |
| 464 | Colfax..... | Colfax College..... | 1885 | Bapt..... | 5 | 120 |
| 465 | College Place..... | Walla Walla College..... | 1892 | 7-Day Ad..... | 13 | 238 |
| 466 | Seattle..... | University of Washington.... | 1862 | Nonsect..... | 18 | 310 |
| 467 | Spokane..... | Gonzaga College..... | 1887 | R. C..... | 8 | 95 |
| 468 | Sumner..... | Whitworth College*..... | 1890 | Presb..... | 10 | 65 |
| 469 | Tacoma..... | Puget Sound University..... | 1890 | M. E..... | 19 | 203 |
| 470 | Vancouver..... | St. James College*..... | 1856 | R. C..... | 6 | 34 |
| 471 | Walla Walla..... | Whitman College..... | 1866 | Cong..... | 13 | 124 |
| | WEST VIRGINIA. | | | | | |
| 472 | Barboursville..... | Barboursville College..... | 1888 | M. E. So..... | 7 | 90 |
| 473 | Bethany..... | Bethany College..... | 1841 | Christian..... | 12 | 125 |
| 474 | Morgantown..... | West Virginia University.... | 1867 | Nonsect..... | 56 | 399 |
| | WISCONSIN. | | | | | |
| 475 | Appleton..... | Lawrence University..... | 1849 | M. E..... | 19 | 361 |
| 476 | Beloit..... | Beloit College..... | 1847 | Nonsect..... | 23 | 443 |
| 477 | Franklin..... | Mission House..... | 1859 | Ref..... | 18 | 100 |
| 478 | Madison..... | University of Wisconsin.... | 1849 | Nonsect..... | 114 | 1,599 |
| 479 | Milton..... | Milton College..... | 1844 | 7-Day Bpt..... | 10 | 146 |
| 480 | Milwaukee..... | Marquette College..... | 1881 | R. C..... | 15 | 231 |
| 481 | Ripon..... | Ripon College..... | 1853 | Cong..... | 18 | 264 |
| 482 | St. Francis..... | Seminary of St. Francis of Sales. | 1856 | R. C..... | 12 | 220 |
| 483 | Watertown..... | Northwestern University.... | 1865 | Luth..... | 9 | 160 |
| | WYOMING. | | | | | |
| 484 | Laramie..... | University of Wyoming..... | 1887 | Nonsect..... | 12 | 118 |

* Statistics of 1894-95.

COLLEGES FOR WOMEN: DIVISION A.
(Organized upon the usual plan of the arts colleges.)

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|----|-----------------------|---------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| | CALIFORNIA. | | | | | |
| 1 | Mills College..... | Mills College..... | 1871 | Nonsect..... | 21 | 120 |
| | ILLINOIS. | | | | | |
| 2 | Rockford..... | Rockford College..... | 1849 | Nonsect..... | 18 | 225 |
| | MARYLAND. | | | | | |
| 3 | Baltimore..... | Woman's College of Baltimore. | 1888 | M. E. | 27 | 231 |
| | MASSACHUSETTS. | | | | | |
| 4 | Cambridge..... | Radcliffe College..... | 1879 | Nonsect..... | 94 | 358 |
| 5 | Northampton..... | Smith College..... | 1875 | Nonsect..... | 54 | 875 |
| 6 | South Hadley..... | Mount Holyoke College..... | 1837 | Nonsect..... | 36 | 331 |
| 7 | Wellesley..... | Wellesley College..... | 1875 | Nonsect..... | 77 | 804 |
| | NEW JERSEY. | | | | | |
| 8 | Princeton..... | Evelyn College*..... | 1887 | Nonsect..... | 22 | 35 |
| | NEW YORK. | | | | | |
| 9 | Aurora..... | Wells College..... | 1868 | Nonsect..... | 21 | 84 |
| 10 | Elmira..... | Elmira College..... | 1855 | Presb. | 18 | 153 |
| 11 | New York..... | Barnard College..... | 1889 | Nonsect..... | 30 | 147 |
| 12 | Poughkeepsie..... | Vassar College..... | 1865 | Nonsect..... | 52 | 543 |
| | PENNSYLVANIA. | | | | | |
| 13 | Bryn Mawr..... | Bryn Mawr College..... | 1885 | Nonsect..... | 32 | 298 |
| | VIRGINIA. | | | | | |
| 14 | Lynchburg..... | Randolph-Macon Woman's College. | 1893 | M. E. So. | 12 | 119 |

COLLEGES FOR WOMEN: DIVISION B.
(Comprising elementary courses.)

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|----|---------------------|----------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| | ALABAMA. | | | | | |
| 1 | Athens..... | Athens Female College..... | 1842 | M. E. | 14 | 150 |
| 2 | Bailey Springs..... | Bailey Springs University..... | 1893 | Nonsect..... | 7 | 30 |
| 3 | East Lake..... | East Lake Athenaeum..... | 1890 | Nonsect..... | 11 | 187 |
| 4 | Eufaula..... | Union Female College..... | 1853 | Nonsect..... | 12 | 87 |
| 5 | Florence..... | Synodical Female College..... | 1845 | Nonsect..... | 4 | 39 |
| 6 | Gadsden..... | Jones College for Young Ladies. | 1850 | M. E. So..... | 17 | 123 |
| 7 | Marion..... | Judson Female Institute..... | 1839 | Bapt. | 10 | 106 |
| 8 | do..... | Marion Female Seminary..... | 1836 | Nonsect..... | 8 | 80 |
| 9 | Talladega..... | Isbell College..... | 1849 | Presb..... | 7 | 89 |
| 10 | Tuscaloosa..... | Central Female College*..... | 1857 | Bapt..... | 9 | 145 |
| 11 | do..... | Tuscaloosa Female College..... | 1860 | M. E. So..... | 10 | 197 |
| 12 | Tuskegee..... | Alabama Conference Female College. | 1855 | M. E. | 18 | 190 |
| | ARKANSAS. | | | | | |
| 13 | Conway..... | Central Baptist College..... | 1892 | Bapt. | 11 | 125 |
| | CALIFORNIA. | | | | | |
| 14 | San José..... | College of Notre Dame..... | 1951 | R. C. | 22 | 88 |
| | GEORGIA. | | | | | |
| 15 | Athens..... | Lucy Cobb Institute..... | 1858 | Nonsect..... | 15 | 151 |
| 16 | College Park..... | Southern Female College..... | 1843 | Bapt. | 30 | 243 |
| 17 | Cuthbert..... | Andrew Female College..... | 1854 | M. E. | 12 | 160 |
| 18 | Dalton..... | Dalton Female College..... | 1872 | M. E. | 9 | 140 |
| 19 | Forsyth..... | Monroe Female College*..... | 1848 | Bapt. | 6 | 90 |
| 20 | Gainesville..... | Georgia Female Seminary..... | 1878 | Nonsect..... | 16 | 232 |
| 21 | La Grange..... | La Grange Female College..... | 1833 | M. E. So..... | 18 | 209 |
| 22 | do..... | Southern Female College..... | 1842 | Bapt. | 20 | 150 |
| 23 | Macon..... | Wesleyan Female College..... | 1839 | M. E. So..... | 17 | 212 |
| 24 | Milledgeville..... | Georgia Normal and Industrial College. | 1891 | Nonsect..... | 19 | 324 |
| 25 | Rome..... | Shorter College..... | 1877 | Bapt. | 15 | 187 |
| 26 | Thomasville..... | Young Female College..... | 1870 | Nonsect..... | 4 | 87 |

* Statistics of 1894-95.

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|----------------|--------------------|------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| ILLINOIS. | | | | | | |
| 27 | Chicago..... | Seminary of the Sacred Heart.* | 1858 | R. C. | 20 | 120 |
| 28 | Jacksonville..... | Illinois Female College..... | 1847 | M. E. | 16 | 170 |
| 29 |do..... | Jacksonville Female Academy. | 1830 | Nonsect..... | 13 | 103 |
| 30 | Knoxville..... | St. Mary's School..... | 1868 | P. E..... | 14 | 101 |
| INDIANA. | | | | | | |
| 31 | Terre Haute..... | Coates College..... | 1885 | Presb..... | 13 | 100 |
| KANSAS. | | | | | | |
| 32 | Oswego..... | College for Young Ladies..... | 1888 | Presb..... | 10 | 47 |
| 33 | Topeka..... | College of the Sisters of Bethany. | 1859 | P. E..... | 16 | 200 |
| KENTUCKY. | | | | | | |
| 34 | Bowling Green..... | Potter College..... | 1889 | ..... | 20 | 215 |
| 35 | Danville..... | Caldwell College..... | 1861 | ..... | 12 | 141 |
| 36 | Hopkinsville..... | Bethel Female College..... | 1854 | Bapt..... | 11 | 67 |
| 37 | Lexington..... | Hamilton Female College..... | 1869 | Christian..... | 16 | 184 |
| 38 | Millersburg..... | Millersburg Female College..... | 1851 | M. E..... | 13 | 163 |
| 39 | Nicholasville..... | Jessamine Female Institute..... | 1854 | Nonsect..... | 12 | 120 |
| 40 | Owensboro..... | Owensboro Female College..... | 1890 | ..... | 7 | 101 |
| 41 | Pewee Valley..... | Kentucky College for Young Ladies. | 1872 | ..... | 11 | 85 |
| 42 | Russellville..... | Logan Female College..... | 1846 | M. E. So..... | 12 | 135 |
| 43 | Stanford..... | Stanford Female College..... | 1871 | Nonsect..... | 7 | 124 |
| 44 | Winchester..... | Winchester Female College*. | 1889 | Nonsect..... | 6 | 45 |
| LOUISIANA. | | | | | | |
| 45 | Clinton..... | Silliman Female Institute.... | 1852 | Presb..... | 11 | 131 |
| 46 | Mansfield..... | Mansfield Female College.... | 1855 | M. E..... | 8 | 51 |
| 47 | Minden..... | Minden Female College..... | 1853 | Nonsect..... | 7 | 145 |
| MAINE. | | | | | | |
| 48 | Deering..... | Westbrook Seminary..... | 1834 | Univ..... | 9 | 85 |
| 49 | Kents Hill..... | Maine Wesleyan Female College. | 1821 | M. E..... | 13 | 219 |
| MARYLAND. | | | | | | |
| 50 | Baltimore..... | Notre Dame of Maryland.... | 1873 | R. C..... | 22 | 54 |
| 51 | Frederick..... | Woman's College..... | 1843 | Ref..... | 17 | 133 |
| 52 | Hagerstown..... | Kee Mar College..... | 1852 | Luth..... | 14 | 120 |
| 53 | Lutherville..... | Maryland College for Young Ladies. | 1853 | Luth..... | 12 | 92 |
| MASSACHUSETTS. | | | | | | |
| 54 | Auburndale..... | Lasell Seminary..... | 1851 | Nonsect..... | 32 | 152 |
| MINNESOTA. | | | | | | |
| 55 | Albert Lea..... | Albert Lea College..... | 1885 | Presb..... | 7 | 35 |
| MISSISSIPPI. | | | | | | |
| 56 | Blue Mountain..... | Blue Mountain Female College. | 1873 | Nonsect..... | 16 | 207 |
| 57 | Brookhaven..... | Whitworth Female College... | 1857 | M. E..... | 10 | 102 |
| 58 | Clinton..... | Hillman College..... | 1853 | Nonsect..... | 7 | 105 |
| 59 | Columbus..... | Industrial Institute and College. | 1885 | Nonsect..... | 18 | 339 |
| 60 | Jackson..... | Belhaven College for Young Ladies. | 1894 | Nonsect..... | 11 | 120 |
| 61 | McComb..... | McComb City Female Institute. | 1894 | Nonsect..... | 5 | 83 |
| 62 | Meridian..... | East Mississippi Female College. | 1869 | M. E..... | 10 | 130 |
| 63 |do..... | Stone College for Young Ladies. | 1893 | Bapt..... | 8 | 89 |
| 64 | Oxford..... | Union Female College*..... | 1854 | Cum. Pres..... | 11 | 145 |
| 65 | Pontotoc..... | Chickasaw Female College.... | 1852 | Presb..... | 8 | 80 |
| 66 | Port Gibson..... | Port Gibson Female College.. | 1843 | M. E..... | 8 | 42 |
| 67 | Water Valley..... | Hamilton College..... | 1894 | ..... | 7 | 96 |
| MISSOURI. | | | | | | |
| 68 | Columbia..... | Christian Female College*... | 1851 | Christian..... | 14 | 153 |
| 69 |do..... | Stephens Female College..... | 1856 | Bapt..... | 16 | 167 |
| 70 | Fayette..... | Howard Payne College..... | 1844 | M. E. So..... | 13 | 148 |
| 71 | Fulton..... | Synodical Female College*... | 1872 | Presb..... | 12 | 119 |
| 72 | Independence..... | Presbyterian College..... | 1871 | Presb..... | 12 | 77 |
| 73 | Jennings..... | St. Louis Seminary..... | 1871 | Nonsect..... | 6 | 30 |
| 74 | Lexington..... | Baptist Female College..... | 1855 | Bapt..... | 9 | 100 |
| 75 |do..... | Central Female College..... | 1869 | M. E..... | 16 | 150 |
| 76 |do..... | Elizabeth Aull Female Seminary.* | 1859 | Presb..... | 14 | 80 |

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|---------------------|--------------------|-------------------------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| MISSOURI. — Cont'd. | | | | | | |
| 77 | Liberty..... | Liberty College for Young Ladies. | 1890 | Nonsect..... | 15 | 152 |
| 78 | Mexico..... | Hardin College..... | 1873 | Bapt..... | 25 | 205 |
| 79 | St. Charles..... | Lindenwood Female College.. | 1830 | Presb..... | 13 | 61 |
| NEW HAMPSHIRE. | | | | | | |
| 80 | Tilton..... | New Hampshire Conference Seminary and Female College. | 1845 | M. E..... | 12 | 232 |
| NEW JERSEY. | | | | | | |
| 81 | Bordentown..... | Bordentown Female College... | 1853 | M. E..... | 13 | 41 |
| NEW YORK. | | | | | | |
| 82 | Brooklyn..... | Packer Collegiate Institute... | 1845 | Nonsect..... | 50 | 759 |
| NORTH CAROLINA. | | | | | | |
| 83 | Asheville..... | Asheville Female College *.... | 1854 | M. E. So..... | 10 | 160 |
| 84 | Dallas..... | Gaston College..... | 1879 | Luth..... | 5 | 94 |
| 85 | Greensboro..... | Greensboro Female College.... | 1846 | M. E. So..... | 15 | 157 |
| 86 | Hickory..... | Claremont Female College.... | 1880 | Nonsect..... | 10 | 80 |
| 87 | Louisburg..... | Louisburg Female College..... | 1857 | M. E..... | 6 | 75 |
| 88 | Murfreesboro..... | Chowan Baptist Female Institute.* | 1848 | Bapt..... | 8 | 80 |
| 89 | Oxford..... | Oxford Female Seminary..... | 1850 | Bapt..... | 8 | 105 |
| 90 | Salem..... | Salem Female Academy..... | 1802 | Moravian..... | 35 | 435 |
| OHIO. | | | | | | |
| 91 | Cincinnati..... | Bartholomew English and Classical School. | 1875 | P. E..... | 14 | 110 |
| 92 | Glendale..... | Glendale Female College..... | 1854 | Nonsect..... | 13 | 93 |
| 93 | Granville..... | Granville Female College..... | 1827 | Presb..... | 8 | 75 |
| 94 |do..... | Shepardson College *..... | 1887 | Bapt..... | 13 | 240 |
| 95 | Oxford..... | Oxford College..... | 1849 | Presb..... | 26 | 210 |
| 96 |do..... | Western College and Seminary. | 1855 | Nonsect..... | 23 | 145 |
| 97 | Painesville..... | Lake Erie Seminary..... | 1859 | Nonsect..... | 21 | 121 |
| PENNSYLVANIA. | | | | | | |
| 98 | Allentown..... | Allentown College for Women. | 1867 | Ref..... | 12 | 115 |
| 99 | Bethlehem..... | Moravian Seminary for Young Ladies. | 1749 | Moravian..... | 20 | 90 |
| 100 | Carlisle..... | Metzger College..... | 1881 | Nonsect..... | 17 | 112 |
| 101 | Chambersburg..... | Wilson College..... | 1879 | Presb..... | 27 | 280 |
| 102 | Lititz..... | Linden Hall Seminary..... | 1794 | Moravian..... | 13 | 35 |
| 103 | Mechanicsburg..... | Irving Female College..... | 1856 | Luth..... | 13 | 117 |
| 104 | Ogontz School..... | Ogontz School..... | 1883 | Nonsect..... | 28 | 155 |
| 105 | Pittsburg..... | Pennsylvania College for Women. | 1870 | Presb..... | 21 | 191 |
| SOUTH CAROLINA. | | | | | | |
| 106 | Columbia..... | Columbia Female College..... | 1859 | M. E. So..... | 14 | 120 |
| 107 |do..... | Presbyterian College for Women.* | 1890 | Presb..... | 16 | 123 |
| 108 | Due West..... | Due West Female College..... | 1858 | A. R. Presb... | 15 | 178 |
| 109 | Gaffney City..... | Cooper-Limestone Institute.... | 1845 | Bapt..... | 8 | 145 |
| 110 | Greenville..... | Greenville College for Women | 1894 | Nonsect..... | 12 | 86 |
| 111 |do..... | Greenville Female College..... | 1854 | Bapt..... | 13 | 146 |
| 112 | Spartanburg..... | Converse College..... | 1890 | Nonsect..... | 30 | 377 |
| 113 | Union..... | Clifford Seminary..... | 1881 | Nonsect..... | 6 | 54 |
| 114 | Williamston..... | Williamston Female College... | 1872 | Nonsect..... | 8 | 80 |
| TENNESSEE. | | | | | | |
| 115 | Bristol..... | Sullins College..... | 1869 | M. E. So..... | 10 | 94 |
| 116 | Brownsville..... | Brownsville Female College.... | 1851 | Bapt..... | 8 | 89 |
| 117 | Columbia..... | Columbia Athenæum..... | 1852 | Nonsect..... | 16 | 161 |
| 118 | Franklin..... | Tennessee Female College..... | 1856 | Nonsect..... | 13 | 110 |
| 119 | Gallatin..... | Howard Female College..... | 1837 | Nonsect..... | 7 | 79 |
| 120 | Jackson..... | Memphis Conference Female Institute. | 1843 | M. E..... | 30 | 316 |
| 121 | Knoxville..... | East Tennessee Institute *.... | 1835 | Nonsect..... | 10 | 92 |
| 122 | Murfreesboro..... | Soule Female College..... | 1852 | Nonsect..... | 9 | 120 |
| 123 | Nashville..... | Nashville College for Young Ladies. | 1880 | M. E..... | 29 | 214 |
| 124 |do..... | Ward's Seminary for Young Ladies. | 1865 | Presb..... | 32 | 372 |
| 125 | Pulaski..... | Martin Female College *..... | 1870 | M. E..... | 17 | 163 |
| 126 | Rogersville..... | Synodical Female College..... | 1849 | Presb..... | 16 | 203 |
| 127 | Winchester..... | Mary Sharp College..... | 1851 | Bapt..... | 6 | 100 |
| TEXAS. | | | | | | |
| 128 | Belton..... | Baylor Female College..... | 1845 | Bapt..... | 17 | 285 |
| 129 | Chapel Hill..... | Chapel Hill Female College *... | 1852 | M. E. So..... | 7 | 80 |

| | Location. | Name. | Year of opening. | Religious denomination controlling. | Professors and instructors. | Students. |
|-----|----------------------|----------------------------------------|------------------|-------------------------------------|-----------------------------|-----------|
| | VIRGINIA. | | | | | |
| 130 | Abingdon..... | Martha Washington College..... | 1860 | M. E. | 12 | 148 |
| 131 | ...do..... | Stonewall Jackson Institute..... | 1869 | Presb. | 9 | 101 |
| 132 | Bristol..... | Southwest Virginia Institute..... | 1884 | Bapt. | 20 | 222 |
| 133 | Buena Vista..... | Young Ladies' College..... | 1894 | Luth. | 10 | 90 |
| 134 | Charlottesville..... | Albemarle Female Institute..... | 1857 | Bapt. | 8 | 51 |
| 135 | Danville..... | Danville College for Young Ladies..... | 1883 | M. E. So. | 8 | 72 |
| 136 | ...do..... | Roanoke Female College..... | 1859 | Bapt. | 7 | 71 |
| 137 | Hollins..... | Hollins Institute..... | 1842 | Bapt. | 28 | 166 |
| 138 | Marion..... | Marion Female College..... | 1873 | Luth. | 9 | 69 |
| 139 | Norfolk..... | Norfolk College for Young Ladies..... | 1878 | Nonsect. | 16 | 211 |
| 140 | Petersburg..... | Southern Female College..... | 1863 | Nonsect. | 12 | 100 |
| 141 | Richmond..... | Richmond Female Institute* | 1854 | Bapt. | 18 | 178 |
| 142 | Staunton..... | Staunton Female Seminary* | 1870 | Luth. | 10 | 60 |
| 143 | ...do..... | Virginia Female Institute..... | 1844 | P. E. | 16 | 86 |
| 144 | ...do..... | Wesleyan Female Institute..... | 1848 | M. E. | 11 | 59 |
| 145 | Winchester..... | Episcopal Female Institute* | 1874 | P. E. | 8 | 61 |
| 146 | ...do..... | Valley Female College..... | 1874 | M. E. So. | 10 | 44 |
| | WEST VIRGINIA. | | | | | |
| 147 | Parkersburg..... | Parkersburg Seminary..... | 1878 | Nonsect. | 3 | 35 |
| | WISCONSIN. | | | | | |
| 148 | Milwaukee..... | Milwaukee and Downer Colleges..... | 1895 | Cong. and Presb. | 13 | 178 |

* Statistics of 1894-95.

CANADIAN UNIVERSITIES.—In Canada the M'Gill College and University at Montreal was founded by royal charter in 1821 (amended in 1852) on the foundation of the Honorable James M'Gill, who died at Montreal on the 19th of December, 1813. A number of colleges and schools throughout the province stand in the relation of affiliated institutions. The university is Protestant, but undenominational. It includes the faculties of arts, applied sciences, medicine, and law. In 1885 the total number of students, including women, was 526. The University of Toronto was originally established by royal charter in 1827, under the title of King's College, with certain religious restrictions, resembling those at that time in force at the English universities; but in 1834 these restrictions were abolished, and in 1849 the designation of the university was changed into that of the University of Toronto. In 1873 further amendments were made in the constitution of the university. The Chancellor was made elective for a period of three years by Convocation, which was at the same time reorganized so as to include all graduates in law, medicine, and surgery, all masters of arts, and bachelors of arts of three years' standing, all doctors of science, and bachelors of science of three years' standing. The powers of the Senate were also extended to all branches of literature, science, and the arts, to granting certificates of proficiency to women, and to affiliating colleges. The work of instruction is performed by University College, which is maintained out of the endowment of the provincial university, and governed by a Council composed of the residents and the professors. Its several chairs include classical literature, logic and rhetoric, mathematics and natural philosophy, chemistry and experimental philosophy, history and English literature, mineralogy and geology, metaphysics and ethics, meteorology and natural history, and lectureships on Oriental literature, German, and French. Other universities and colleges with power to confer degrees are the Victoria University at Cobourg (1836), supported by the Methodist Church of Canada; Queen's University, Kingston (1841), representing the Presbyterian body; and the University of Trinity College, Toronto, founded in 1851 on the suppression of the faculty of divinity in King's College. Lennoxville is a centre for university instruction in conformity with Church of England principles. See CANADA.

AUSTRALIAN UNIVERSITIES.—In Australia, the University of Sydney was incorporated by an act of the colonial legislature which received the royal assent 9th December, 1851, and on the 27th February, 1858, a royal charter was granted conferring on graduates of the university the same rank, style, and precedence as are enjoyed by graduates of universities within the United Kingdom. Sydney is also one of the institutions associated with the University of London, from which certificates of having received a due course of instruction may be received with a view to admission to degrees. There are four faculties—viz., arts, law, medicine, and science. The design of the university is to supply the means of a liberal education to all orders and denominations, without any distinction whatever. An act for the purpose of facilitating the erection of colleges in connection with different religious bodies was, however, passed by the legislature during the session of 1884, and since that time colleges representing the Episcopalian, Presbyterian, and Roman Catholic churches have been founded. In 1885 the total number of students attending lectures in the university was 206.

The University of Melbourne, in the colony of Victoria, was incorporated and

endowed by royal act of the 22d of January, 1853. This act was amended June 7th 1881. Here, also, no religious tests are imposed on admission to any degree or election to any office. The Council is empowered, after due examination, to confer degrees in all the faculties (excepting divinity) which can be conferred in any university within the British dominions. It is also authorized to affiliate colleges; and Trinity College (Church of England) was accordingly founded in 1870, and Ormond College (Presbyterian) in 1879. The founding of a university for Queensland has been for some time in contemplation. The University of Adelaide in South Australia (founded mainly by the exertions and munificence of Sir Walter Watson Hughes) was incorporated by an act of the colonial legislature in 1874, in which year it was further endowed by Sir Thomas Elder. In 1881 letters patent were granted by the English Crown whereby degrees conferred by the university were constituted of equal validity with those of any university of the United Kingdom. The faculties in the university are those of arts, medicine, law, science, and music. The number of matriculations since the foundation amounted, in 1886, to 284, the number of undergraduates in that year being 90.

The University of New Zealand, founded in 1870, and reconstituted in 1874 and 1875, is empowered by royal charter to grant several degrees of bachelor and master of arts, and bachelor and doctor in law, medicine, and music. Women are admitted to degrees. To this the Auckland University College, Nelson College, Canterbury College, and the University of Otago, stand in the relation of affiliated institutions. This last-named institution was founded in 1869 by an order of the provincial council, with the power of conferring degrees in arts, medicine, and law, and received as an endowment 100,000 acres of pastoral land. It was opened in 1871 with a staff of three professors, all in the faculty of arts. In 1872 the provincial council further subsidized it by a grant of a second 100,000 acres of land, and the university was now enabled to make considerable additions to the staff of professors and lecturers, to establish a lectureship in law, and to lay the foundations of a medical school. In 1874 an agreement was made between the University of New Zealand and that of Otago, whereby the functions of the former were restricted to the examination of candidates for matriculation, for scholarships, and for degrees; while the latter bound itself to become affiliated to the University of New Zealand, to hold in abeyance its power of granting degrees, and to waive the claim which it had advanced to a royal charter. As the result of this arrangement, the University of Otago became possessed of 10,000 acres of land, which had been set apart for university purposes in the former province of Southland. In 1877 a School of Mines was established in connection with the university.

INDIAN UNIVERSITIES.—In India, the oldest universities date from 1857,—that of Calcutta having been incorporated January 24th, Bombay, July 18th, Madras, September 5th in that year. At these three universities the instruction is mainly in English. "A university in India," says Sir R. Temple, "is a body for examining candidates for degrees, and for conferring degrees. It has the power of prescribing text-books, standards of instruction, and rules of procedure, but is not an institution for teaching. Its governance and management are vested in a body of fellows, some of whom are *ex officio*, being the chief European functionaries of the state. The remainder are appointed by the government, being generally chosen as representative men in respect of eminent learning, scientific attainment, official position, social status, or personal worth. Being a mixed body of Europeans and natives, they thus comprise all that is best and wisest in that division of the empire to which the university belongs, and fairly represent most of the phases of thought and philosophic tendencies observable in the country. The fellows in their corporate capacity form the Senate. The affairs of the university are conducted by the Syndicate, consisting of a limited number of members elected from among the fellows. The faculties comprise arts and philosophy, law, medicine, and civil engineering. A degree in natural and physical science has more recently been added." The Punjab University was incorporated in 1883—the Punjab University College, prior to that date, having conferred titles only and not degrees. The main object of this university is the encouragement of the study of the Oriental languages and literature, and the rendering accessible to native students the results of European scientific teaching through the medium of their own vernacular. The Oriental Faculty is here the oldest, and the degree of B.O.L. (Bachelor of Oriental Literature) is given as the result of its examinations. At the Oriental College the instruction is given wholly in the native languages. In 1887, the Senate at Cambridge, England, adopted resolutions whereby some forty-nine collegiate institutions already affiliated to the latter body were affiliated to the University of Cambridge, their students thus becoming entitled to the remission of one year in the ordinary statutable requirements with respect to residence at Cambridge. It is at these institutions, and the colleges of the first or second grade in the other presidencies, that the instruction is given. See Lethbridge, *High Education in India* (1882).

Besides the works already cited, the reader is referred to Cantoni, *La Questione Universitaria* (Milan, 1874); Seeley, *Lectures and Essays*, pp. 182–216 (1870); Humphrey's *Higher Education in America and Europe*; Newman, *The Idea of a University* (1873); id., *Rise and Progress of Universities* (1872); Tappan, *University Education*; Wooton, *Guide to Degrees in Arts, Sciences, etc.* (1887); Wood, *Degrees, Gowns, and Hoods* (1883); id., *Ecclesiastical and Academic Colors* (1884); Burgess, *The American*

University (1882); Porter, *American Colleges and the American Public* (1875); Thwing, *American Colleges* (2d. ed., 1883); Coubertin, *Universités Transatlantiques* (1890).

UNIVERSITY EXTENSION, briefly defined, is an attempt to carry the university to the people, when the people cannot come to the university. It is at once a missionary and a democratic movement. While proceeding from generous and enlightened college men, it is at the same time part of the general progress of the English people during the nineteenth century. The Reform Bill of 1832, the Chartist movement from 1838 to 1848, the widening of the suffrage, and the recent establishment of popular education, are only landmarks in the rising flood. The idea of extending more widely university privileges to the English people by means of local colleges was proposed by William Sewall, of Oxford, in the year 1850. The idea was not realized until 1876, when University College at Bristol was established by the joint efforts of two Oxford colleges. Many pioneer attempts were made by university men in the direction of higher popular education. The founding of mechanics' institutes, beginning with Dr. Birkbeck's lectures to workmen in Glasgow in 1800 and with the Birkbeck Institute in London, in 1823, led the way to a long line of popular establishments, in which college men rendered good educational service as teachers and lecturers. The social influence of the French Revolution of 1848 made itself deeply felt in England. In 1854, Frederick Denison Maurice founded the Workingmen's College in London. University graduates like Thomas Hughes, John Ruskin, J. S. Brewer, and J. R. Seeley lent a hand in the conduct of evening classes. A desire to improve the standards of adult education led Dr. Temple and other university men in London to establish a system of examinations for mechanics' institutes. From this beginning proceeded the entire system of local examinations for the benefit of middle class schools and teachers. Oxford University gave its sanction to this movement in 1857. Cambridge and other universities followed the example of Oxford, and thus gradually the whole system of popular education was taken in hand.

In 1867 Professor James Stuart, of Cambridge, was invited by the North of England Council for the Education of Women to lecture upon the art of teaching. He consented to illustrate the subject by giving eight lectures upon astronomy to classes of ladies in Leeds, Liverpool, Manchester, and Sheffield. In connection with these classes were developed three of the principal educational characteristics of University Extension: (1) Circuit lectures; (2) the use of a printed syllabus, to save note-taking and serve as a means of review and home study; (3) weekly written exercises, prepared by students at home in their own time, in answer to proposed questions, and sent by post to the lecturer for correction. This first experiment proved very successful, and led to the institution of ladies' lectures in Cambridge, and finally to the institution of Newnham College. By invitation, Professor Stuart soon extended his course of instruction to workmen and co-operative societies in the North of England. In this connection originated the fourth feature of University Extension—namely, the class, for public review and discussion of the lecture. The fifth characteristic, or final written examination, was added in 1873, when Cambridge University formally sanctioned this system of educational work and began to apply the machinery of local examinations to the testing of the results of local lectures. Two kinds of certificates are now issued—"Pass" and "Distinction." They are said to imply quite as good work as that usually tested by university examinations in similar lines of work.

Unit courses of twelve lectures are now given by Cambridge men in three groups of subjects: (1) literature and history; (2) science, and (3) art appreciation. Extension students who have passed satisfactory examinations in six consecutive unit courses in one group, and two other unit courses, together with examinations in Latin, one other foreign language, and in algebra and Euclid, are now admitted to Cambridge University with credit for one year's advanced standing, and may obtain the bachelor's degree by two years' further study in residence. Thus the middle wall of partition between the university and the people is completely broken down. Any talented young workingman whose mind is awakened by University Extension lectures can now enjoy a regular college course, if he has the necessary persistence. Local prizes and university scholarships are awarded to extension students in order to encourage the highest work and afford periods of special study at the university.

One of the clearest and most concise descriptions of the University Extension system is that written by a Northumberland miner, who had attended extension lectures for several terms: "Any town or village which is prepared to provide an audience, and pay the necessary fees, can secure a course of twelve lectures on any subject taught in the University, by a lecturer who has been educated at the University, and who is specially fitted for lecturing work. A syllabus of the course is printed and put into the hands of students. This syllabus is a great help to persons not accustomed to note-taking. Questions are given on each lecture, and written answers can be sent in by any one, irrespective of age or sex. All the lectures, except the first, are preceded by a class, which lasts about an hour. In this class the students and the lecturer talk over the previous lecture. The written answers are returned with such corrections as the lecturer deems necessary. At the end of the course an examination is held and certificates are awarded to the successful candidates. These lectures are called University Extension Lectures. They impart, so far as each subject is treated, a university education."

Oxford began, 1878, to engage in University Extension work. Her lecturers have followed much the same methods as those of Cambridge, although it has been found expedient in many localities to give shorter courses of instruction. Oxford has generously equipped her lecturers with so-called "Traveling Libraries," or working collections of standard books, for use in communities where library facilities are inadequate to the needs of extension classes. Where local libraries exist, co-operation with extension work is usually afforded. A so-called "University Extension Table" is often supplied with those books which readers are likely to find useful. Oxford men have developed a very attractive style of interleaved syllabus for note-taking. It is customary in England to make the printed syllabus interesting to the reader by means of striking quotations and thoughtful suggestions. Oxford extension is under the direction of a university committee, the secretary of which is Mr. M. E. Sadler, joint author with H. J. Mackinder, of a little book on "University Extension: Has it a Future?" Mr. Sadler advocates state aid for University Extension.

The London Society for the Extension of University Teaching was organized in 1876. Its object is to bring university teaching within reach of persons of all classes and of both sexes living in London and its neighborhood, and to work in as close connection with the Universities of Oxford, Cambridge, and London as may be possible. Upon the Council of this society are representatives not only of the great universities but of the following London institutions: Bedford College, Birkbeck Institute, City of London College, College for Men and Women, King's College, London Institution, Queen's College, Royal Institution, University College, and the Workingmen's College. Thus all the higher educational forces of the great metropolis are combined for the extension of university teaching. Extension lectures are given at some of these institutions and at a great number of other centres in different parts of London. Gresham College, a sixteenth-century endowment for the education of busy people, has come into special prominence in connection with University Extension. Another prominent centre is Toynbee Hall, or the Universities' Settlements in East London. One of the best agencies in extension work is to be found in these colonies of university men, these social and educational missions in the industrial quarters of London. People's lectures in great halls are now given for the purpose of awakening public interest in extension courses, which aim not so much at mass meetings as at the formation of intelligent classes for real study. The practical management of the London Society is under the direction of Dr. R. D. Roberts, author of "Eighteen Years of University Extension" (Macmillan, 1891). Dr. Roberts is also the present assistant secretary of Cambridge University Extension. He is an earnest advocate of the establishment of a Teaching University in London, for the purpose of co-ordinating the higher educational interests of the metropolis, and providing advantages that are not offered by the present University of London, which is merely an examining body. See UNIVERSITY SETTLEMENTS.

The London Society employed thirty-eight lecturers in 1889-90, eight of whom also lectured for Cambridge and two for Oxford. Cambridge had upon her staff twenty-four, and Oxford the same number. The men engaged in extension work are not usually members of any academic faculty, although they sometimes hold fellowships and minor academic positions. The policy of rewarding good extension lecturers by appointments to fellowships seems to be growing in favor. Any university man can become an extension lecturer if his academic record, his syllabus, and his method of lecturing are approved by competent authority. Junior lecturers are sometimes sent out to observe the methods of their seniors. The reflex influence of improved methods of lecturing has already made itself felt upon the English colleges. Summer schools are now maintained by Oxford, Cambridge, and the University of Edinburgh. This device, like the English Home Reading Circles, was borrowed from Chautauqua, as English educators frankly admit. Some of the best professors and public men in England lecture to extension students in the summer season. Extension courses are now offered not only by Oxford and Cambridge, but by the Welsh and Irish colleges and by the Universities of Scotland and Australia. In the year 1889-90 there were more than 250 centres of University Extension in England and more than 41,000 attendants upon lectures.

In America the spirit of University Extension was known long before the name came into current use. As early as 1808 Professor Benjamin Silliman, of Yale College, began to give popular courses of lectures in chemistry to the people of New Haven. He and other college men extended this kind of work to the Mechanics' Institute of New Haven and to popular audiences in Hartford, Salem, Boston—in fact throughout New England and the country at large. The old lyceum system of public lectures was promoted chiefly by college men, and it has proved of great educational value in the North and West, where it still survives. College men have also lectured to the people in connection with farmers' institutes, teachers' institutes, and summer schools of the college and of the Chautauqua type. Many universities, like Harvard, Yale, Columbia, Pennsylvania, the Johns Hopkins, and state institutions, South and West, have long been in the habit of offering public courses of lectures. University men in Baltimore lent a hand in the formation of a Workingmen's Institute and lectured to the members in 1879-80. Biological lectures to the employés of the Baltimore and Ohio Railroad were printed for home study in 1882.

Perhaps the first conscious attempt in this country to introduce University Extension

methods was made in the fall and winter of 1887 by individual instructors and graduate students in the department of history and politics at the Johns Hopkins University. Local and systematic courses of lectures were then or afterwards given to church societies, workingmen's clubs, guilds, teachers' associations, Young Men's Christian Associations, Chautauqua circles, Epworth Leagues, and other organizations, usually with a printed syllabus, oral discussions, and examinations. The idea was extended from Baltimore to Washington (1888-91), to Philadelphia (1890), also to the American Library Association (1887-90), and to Chautauqua (1888-91) by repeated public presentations of the subject by Dr. Herbert B. Adams. Successful experiments in University Extension have been made by Dr. E. W. Bemis, a Johns Hopkins graduate, in connection with public libraries in the cities of Buffalo and St. Louis.

A project for University Extension was drawn up by H. B. Adams and adopted by the managers of Chautauqua as early as the summer of 1887. A plan was published in September of that year giving a history of University Extension, its aims, methods of work, organization, and the cost of courses. It was proposed to revive in the United States the original idea of a university as a voluntary association of students and itinerant lecturers, and to promote good citizenship by the popular study of social science, economics, history, literature, and natural science. Co-operation was proposed with American colleges, public libraries, mechanics' institutes, lyceums, labor-unions, Young Men's Christian Associations, and local branches of Chautauqua. This plan has served a good missionary purpose, and has led to greater continuity and better methods in the educational work of the Chautauqua summer assemblies and local circles.

In November, 1887, in connection with the Brooklyn Teachers' Association, Mr. Seth T. Stewart, a Yale graduate and prominent educator, organized a movement called "University and School Extension." It is a comprehensive plan for guiding courses of reading in special subjects under the direction of competent professors chosen from the faculties of Harvard, Yale, Columbia, Princeton, and other well-known institutions. Elaborate and suggestive syllabuses representing various branches of literature, history, and science have been published and are now in extensive use. Under the auspices of University and School Extension, lectures were given by college professors from Harvard, Yale, Columbia, and Princeton, in the spring of 1891 at various educational centres in New York and Brooklyn. The courses at Columbia College were perhaps the most successful. The movement is full of promise, and is sanctioned by association with many eminent names of college presidents and other well-known educators.

The Philadelphia Society for the Extension of University Teaching was organized in June, 1890, with the Provost of the University of Pennsylvania as President, and Mr. George Henderson as Secretary. The latter went to England and made a careful study of the English system, and upon his return published an interesting report upon the subject. Practical work was begun in November, 1890, and before the close of the first season no less than 42 public courses of extension lectures had been given to large and enthusiastic audiences. One of the most experienced English lecturers, Mr. R. G. Moulton, of Cambridge, spent ten weeks in Philadelphia, and gave a strong impulse to the work. Not only cultivated and fashionable people in conservative Philadelphia, but also the working-classes, became interested in the movement. Dr. Pepper resigned active leadership in April, 1891, and Professor E. J. James was chosen to be his successor. The Philadelphia organization is now known as "The American Society for the Extension of University Teaching," and is diligently engaged in missionary work for the promotion of University Extension throughout the country.

The Regents of the University of the State of New York have taken a decided interest in the higher education of the people. The subject of University Extension was publicly presented by their secretary, Mr. Melvil Dewey, at Albany, in July, 1889. In the spring of 1891 a bill was passed by the New York Legislature appropriating \$10,000 for the organization of University Extension. The money is not to be used for the payment of local lecturers, but simply for the general promotion of the cause. University Extension has been formally adopted by the faculty and Regents of the University of Wisconsin, and has been tried with great success in the States of Minnesota, Indiana, and other parts of the West.

The best method of introducing college or University Extension courses in any part of the country is for a community to organize with an efficient local secretary, and to raise by subscription a guarantee fund for the payment of expenses, which ought not to be more than \$350 for a course of twelve lectures. A fee of \$25 per lecture is quite reasonable. The application for a lecturer should be made to the nearest college or university. The entire burden of management and of finance should be assumed by the locality. By proper advertising and a local canvass for the sale of tickets, a large part of the necessary expense can be met, so that only a certain proportion of the guarantee fund will need to be collected. It is too much to expect, unless circumstances are highly favorable, that receipts should balance expenditures. The higher education, indeed all education, is far from being self-supporting. In England an extension course is considered successful if one half the cost is met by admission fees. Tickets for the entire course should be sold at a reasonable figure, perhaps \$1, or \$1.50 for a double ticket admitting a gentleman and lady. In England the price varies from one shilling to one pound, according to the character of the community. A University Extension audience should be as miscellaneous as a church congregation, or public school.

Courses should be organized under the auspices of leading citizens, with the mayor or some representative public man at the head; and the lectures should be given in some neutral place like the town hall, public library, high school, or academy. Teachers and librarians can be very helpful in organizing local branches of University Extension. Graduates of colleges, young men and young women, ought everywhere to be apostles of the new movement. The American Collegiate Alumnae Associations, East and West, have been especially active in the work of educational propaganda. Miss Helen Dawes Brown, a Vassar graduate, read a paper on "University Extension" before the Association of Collegiate Alumnae, October 26, 1889, in which she quoted Thoreau's striking remark: "It is time we had uncommon schools, that we did not leave off our education when we begin to be men and women. It is time that villages were universities."

The literature of University Extension includes the official publications of University Extension Boards, reports of conferences and summer meetings, and a vast number of plans, announcements, and published syllabuses. Important for the student are papers by Albert Grey, M.P., E. T. Cook, and Dr. R. D. Roberts in the sixteenth volume of *Health Exhibition Literature*, London, 1884. R. G. Moulton's detailed account of *The University Extension Movement, with an Introduction by Professor Stuart, M.P.*, was published in 1885. In Stedman's *Oxford: Its Life and Schools*, M. E. Sadler has a chapter on University Extension. Sadler's *Suggestions for the Future Development of University Extension Teaching* were published in 1891. In Mullinger's *History of the University of Cambridge* there is a chapter on Local Examinations and University Extension. Of recent date are the books of Sadler and Mackinder on *University Extension: Has it a Future?* and of Dr. Roberts on *Eighteen Years of University Extension*. An excellent paper on *University Extension in England*, by Robert A. Woods, of Toynbee Hall, was published in *The Andover Review* for March, 1891. *The Paternoster Review* for December, 1890, and *The Quarterly Review*, April, 1891, also contain articles upon the subject. Oxford publishes a *University Extension Gazette*, while *The University Extension Journal* represents both Cambridge and London.

Various contributions to the subject have appeared in the United States. Papers on University Extension by Dr. Herbert B. Adams were printed in the Report of the Commissioner of Education for 1885-86, pp. 749-768, and in the *Johns Hopkins University Studies* (November, 1887), 5th Series, xi., pp. 457-469. His address before the State Historical Society of Wisconsin, January 28, 1891, on "The Higher Education of the People," was published by the Society. See also his article on "University Extension in America," in *The Forum*, July, 1891, and his "American View of University Extension" in *The Review of Reviews* (American edition), July, 1891. A more elaborate report upon the subject by Dr. Adams is to be published by the U. S. Bureau of Education. Dr. Wm. T. Harris, U. S. Commissioner of Education, read a paper on *University and School Extension* before the National Educational Association, at St. Paul, Minnesota, in July, 1890. His address in New York on "What the Universities can do for the People" has also been printed. Mr. Seth T. Stewart, of Brooklyn, has issued a great number of circulars and syllabuses representing University Extension. Melvil Dewey's address (1889) on *The Extension of the University of the State of New York*, in the *Proceedings of the 27th Convocation*, is a very suggestive contribution. President T. C. Chamberlin, of the University of Wisconsin, gave an address upon "University Extension" before the Wisconsin Teachers' Association, December 29, 1890. Highly valuable is George Henderson's Report upon "The University Extension Movement in England" (1890). R. G. Moulton's *Lecturer's Notes on the Working of University Extension* and other useful papers have been issued by the American Society for the Extension of University Teaching (Secretary's Office, 1602 Chestnut Street, Philadelphia). Mr. Skidmore's articles on "University Extension" appeared in *Lippincott's Magazine* in October, 1890, and in May, 1891. A full account of the Philadelphia movement, with many suggestive papers from various parts of the country, may be found in John Wanamaker's *Book News*, Philadelphia, May, 1891. An article on "University Extension and the University of the Future," the substance of addresses delivered before the Johns Hopkins and other universities, by R. G. Moulton, appeared in the *Johns Hopkins University Studies*, March-April, 1891, 9th Series, iii.-iv., pp. 219-232. A *University Extension Journal* is (1893) published by the American Society for the Extension of University Teaching.

UNIVERSITY OF FRANCE. See **UNIVERSITY.**

UNIVERSITY SETTLEMENTS. One of the most practical attempts to elevate the degraded masses of large cities is of recent origin, and consists in the establishment in tenement districts of settlements or houses where educated men and women live either permanently or temporarily, and work among the poor. The first step in this direction was taken in 1867 by Edward Denison, a graduate of Oxford, who went to live in the east end of London for the purpose of studying the wants and grievances of the poor, and of doing educational work among them. A similar task was undertaken in Oxford by Arnold Toynbee, another university graduate, whose zealous labors led to his early death in 1883, but whose deeds and name were perpetuated by the founding in Whitechapel, East London, Jan. 10, 1885, of Toynbee Hall, and later of Oxford Hall. These build-

ings were established and are maintained by graduates of Oxford and Cambridge, both lay and clerical, who reside there, and by associating on equal terms with the poor and uneducated, put their culture to use in bettering the mental, moral, and physical condition of their less fortunate brothers and sisters. The educational element has been perhaps the most prominent, for the needs of the artisan class, as well as of the lowest grade of society, have been considered, and Toynbee Hall has become the centre of University Extension work in that part of the city. A college settlement was opened, in 1891, in Canningtown, London, by students of Mansfield College (Cong.), Oxford.

A College Settlement was established in New York in the fall of 1889 by graduates of some of the women's colleges of the United States. The building, No. 95 Rivington St., is situated in one of the most crowded tenement districts of the "East Side," and among a foreign population.

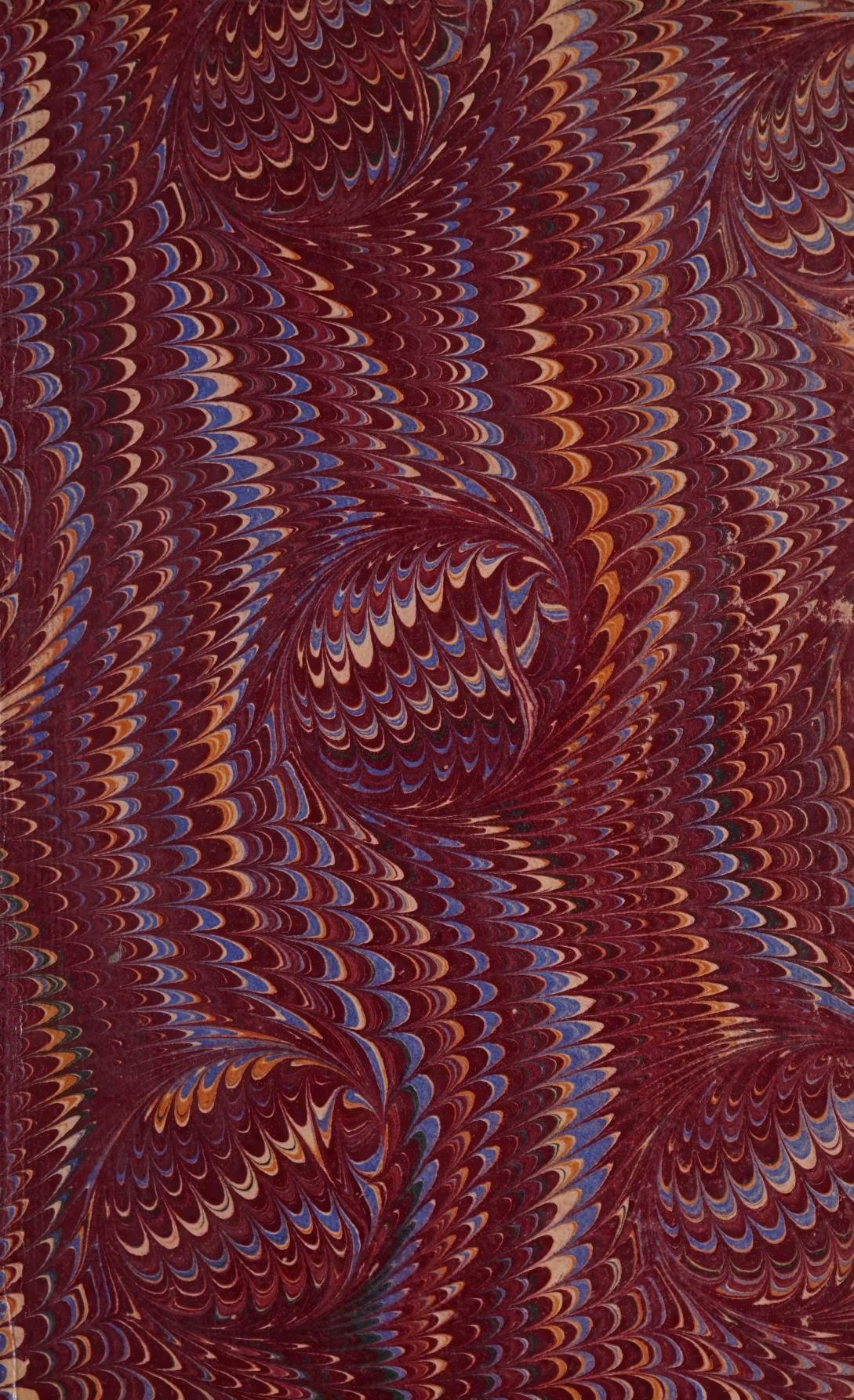
The period of residence varies from three months to a year or longer, and as each inmate pays a weekly sum for board, the house is almost entirely self-supporting. The workers, among whom is a physician, are chiefly graduates of Smith, Wellesley, Vassar, and Bryn Mawr. Children and youth are the principal objects of attention, and the instrumentalities employed are a library, a penny provident bank, familiar talks and lectures, classes in sewing, cooking, gymnastics, etc., and clubs of various kinds which require a weekly fee and are self-supporting. A system of friendly house visitation is pursued, and much work is done in connection with other charitable institutions and with churches in the vicinity.

In 1891, May 14, a University Settlement Society was organized in New York by graduates of Yale, Columbia, Princeton and other colleges, for the purpose of conducting by means of "neighborhood houses" work similar to that done in London, and by the College Settlements Association, already described; making use as a nucleus of a Neighborhood Guild at 147 Forsyth St. long in successful operation and carried on by college-bred men. In October of that same year, a building in one of the tenement districts of Boston was purchased by graduates of Andover Theological Seminary and other ex-collegians; was denominated "Andover House," and was set apart for educational and religious work, according to the following methods:

1. Careful social analysis of the neighborhood.
2. Personal contact with the people for all purposes of sympathy and help.
3. Co-operation with all forces which act directly or indirectly for the elevation of the neighborhood, and with the general social agencies of the city.
4. Investigation of abuses, with appeal to proper parties for remedy.
5. Organization of clubs for social improvement among working-men, boys, etc.
6. Classes in elementary and advanced subjects.
7. Direct religious work as occasion may offer, when it may fitly be carried out without interfering with the churches.

In every instance, experiments of this kind have been rewarded with remarkable success, and among the opportunities afforded those who engage in them, that of studying social, economic, and political problems is not the least.





UNIVERSITY OF ILLINOIS-URBANA



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